

BHS

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83

PRICE ONE GUINEA IN BOARDS,

Illustrated by Copper-plate Engravings, and Cuts referring
to, and explaining the different figures to be executed.

SPECIMENS

IN

Eccentric Circular
TURNING,

WITH

PRACTICAL INSTRUCTIONS

FOR

Producing Corresponding Pieces

IN THAT ART.

By J. H. IBBETSON.

LONDON:

PRINTED FOR THE AUTHOR,

AND SOLD BY WETTON AND JARVIS, 65, PATERNOSTER ROW;

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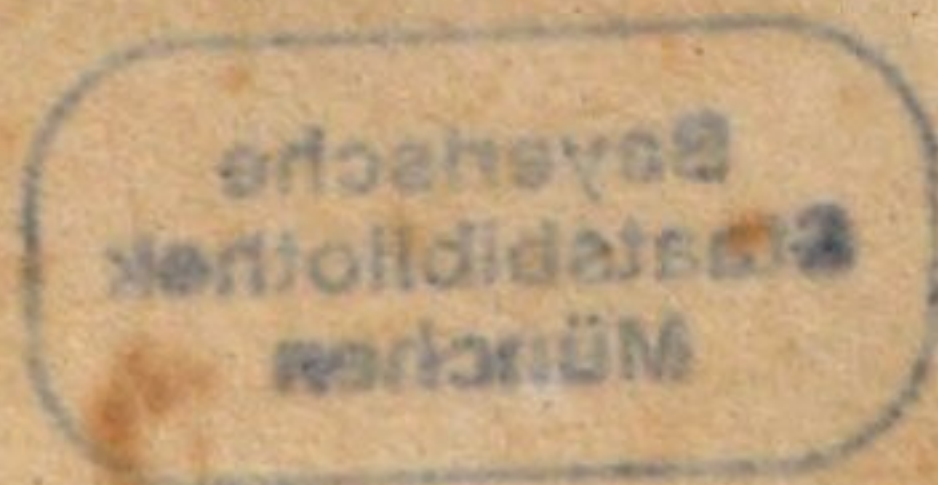
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—◆—
1818.



INTRODUCTION.

sensibly felt the advantage he would have derived, could he have informed himself of the progress which had been made by others, and he regrets the information that has daily escaped him, for want of a reciprocity of communication among his contemporary Turners. In the hopes, therefore, of inducing others to co-operate with him to remedy this evil, he has long had it in contemplation to make known the result of some of his labours, but the very great expense of getting the necessary engravings executed, indeed the almost impossibility of getting them done at all, has hitherto prevented him from carrying his intention into effect. He has, however, never abandoned his object ; and pursuing it, has, at length, constructed a piece of Machinery which enables him to engrave the copper-plates himself.

INTRODUCTION.

Having so far overcome his difficulties, he now ventures to offer to the attention of the Turner, a Series of Specimens in Eccentric Circular Turning; and should this attempt at something novel in the Annals of Turning, be the means of inducing others to communicate the result of their labours to the Public, in the same or any other branch of Turning, he will be amply gratified.

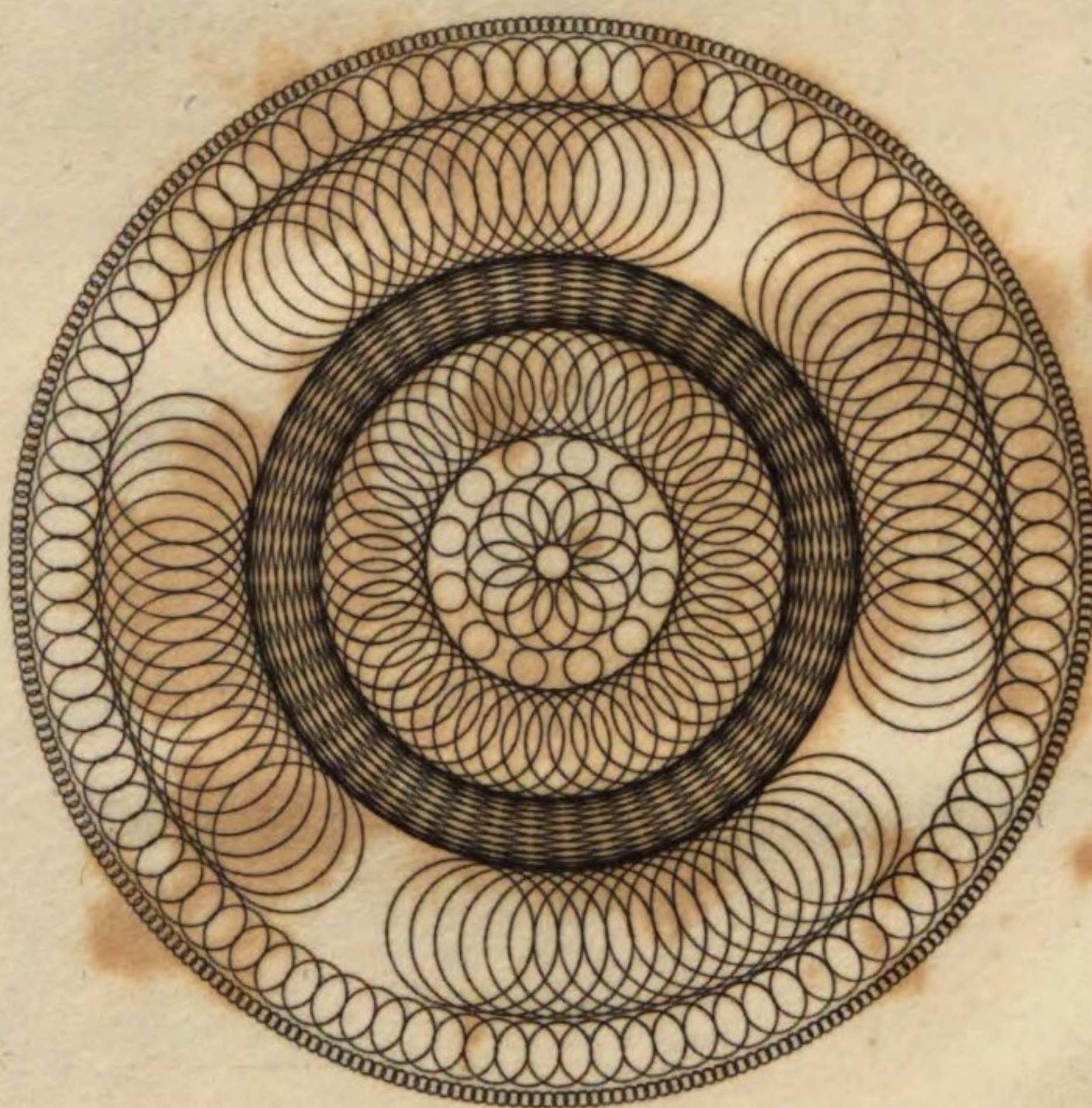
The copper-plate Engravings represent the pieces of Turning to be executed on ivory, wood, or other materials, and each plate is accompanied by such Practical Instructions, as will enable any one, who has acquired the least practical knowledge in Eccentric Turning, to produce the desired effect.

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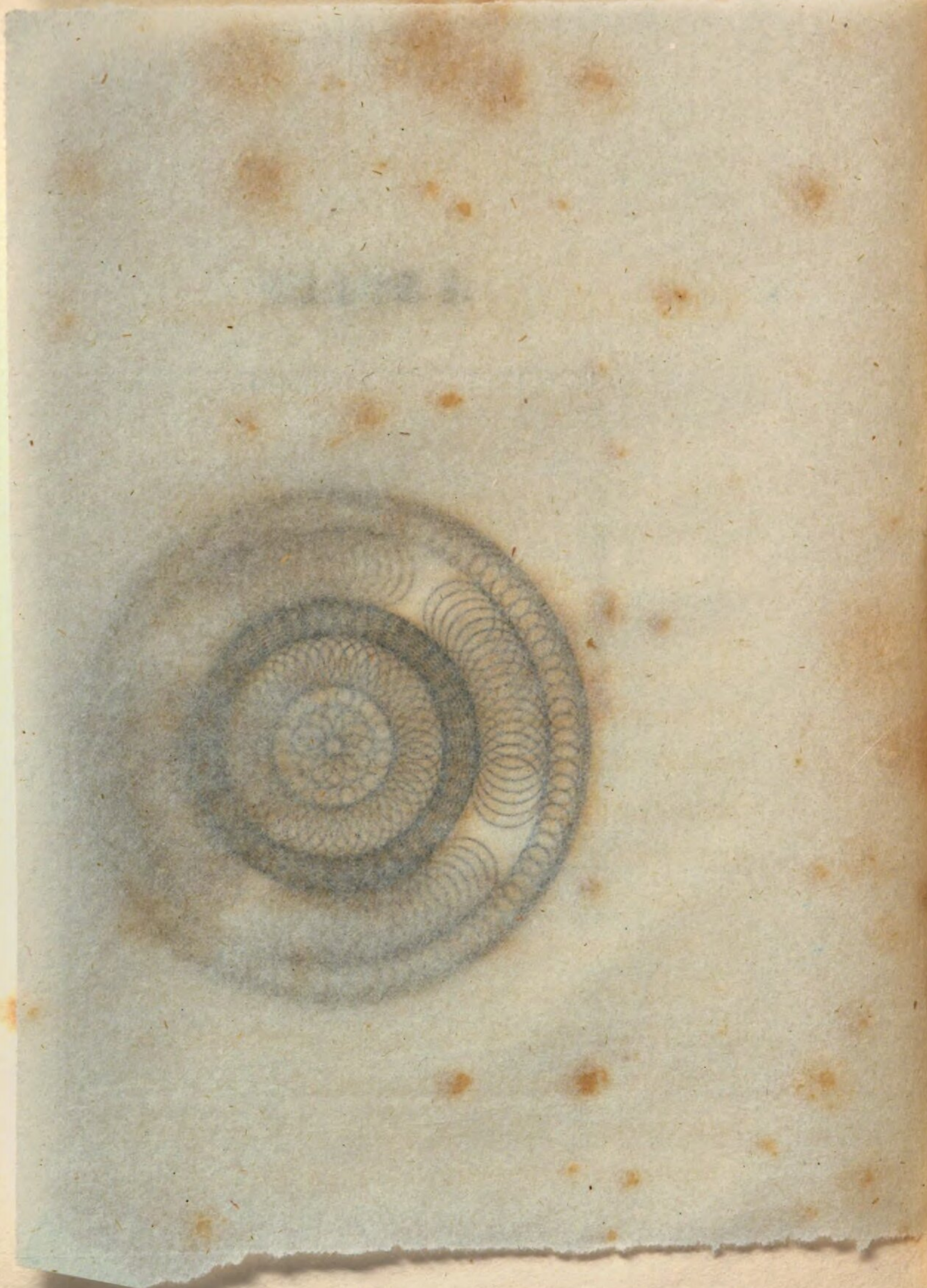
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PLATE I.



The design is a set of seven circles, each
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mon center. The number of circles which
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SPECIMENS
IN
Eccentric Circular Turning.

SPECIMEN I.

THE pattern in Eccentric Turning, which is described in this Specimen, and represented in the accompanying plate, is peculiarly adapted for the lid of a snuff-box; or three or four of the centre figures may be selected, and applied to decorate a set of backgammon-men.

This specimen is composed of seven sets of circles, of different radii, arranged, at different eccentricities, round the common centre. The number of circles which compose the interior, or centre set, is

twelve; the number in the exterior set, is two hundred and eighty-eight: the latter number may, however, be greater than can be obtained with the common eccentric chuck, and another set, therefore, is described, which may be substituted by those who have not the means of adopting the one exhibited in the plate.

The following is a practical description of the method to be pursued to produce a piece of Eccentric Turning similar to Plate I.

The tools with which the work is to be executed are double angular, Nos. 25, 32 and 36, according to Messrs. HOLT-ZAPFFEL and DEYERLEIN's construction of this sort of tool, and the slide rest is to be set at right angles with the mandril of the lathe. Fix an angular tool, No. 25, in the slide rest, and adjust the eccentric chuck, slide rest, and the point of the angular tool, with the nicest correctness, to the common centre, and proceed to execute the interior, or centre set of circles.

FIRST SET OF CIRCLES.

Eccentricity equal to 3.

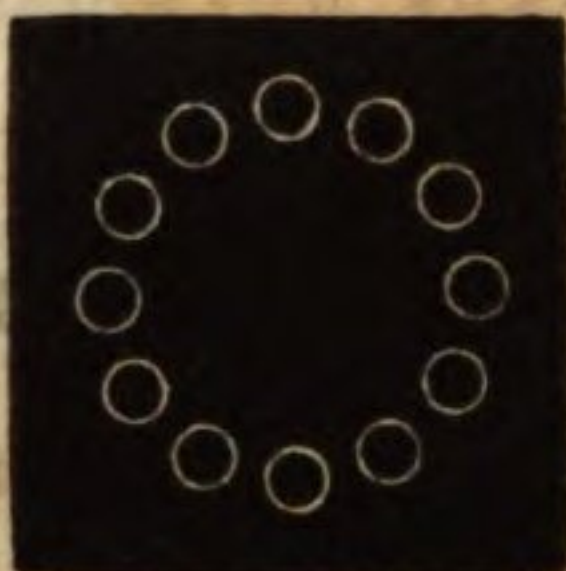
Radius equal to 2.

To produce the eccentricity, turn the slide screw of the eccentric chuck backwards three turns; to produce the radius, turn the slide rest screw backwards two turns;* then describe twelve circles, equidistant from each other, round the common centre. These circles must be cut sufficiently deep to give a sharp edge to the figures, which the angular tool will produce; and this effect must be obtained, although it may be attended with the labour of going over the circles, and cutting them deeper, a second or third time: but to whatever depth this set of circles

* It is to be understood that the slide screw of the eccentric chuck, and the screw of the slide rest, are equal in velocity.

is cut, the same depth must be preserved throughout all the other parts of this pattern, excepting the exterior set of circles, regarding the depth of which, mention will be made hereafter.

SECOND SET OF CIRCLES.



Eccentricity equal to 6.

Radius equal to 1.

To produce the eccentricity, turn the slide screw of the eccentric chuck backwards three turns; which, in addition to the former, makes the eccentricity equal to six. To make the radius equal to one, turn the slide rest screw forwards one turn, which is a decrease of the former radius equal to one turn. Then, with the angu-

lar tool as before, describe twelve equidistant circles.



THIRD SET OF CIRCLES.



Eccentricity equal to 10.

Radius equal to 3.

Change the angular tool to No. 36, but, before it is fixed in the slide rest, adjust it to the radius and depth of the circle which was last turned. Then, to produce the eccentricity, turn the slide screw of the eccentric chuck backwards four turns; and, to produce the radius, turn the slide rest screw backwards two turns. Describe forty-eight equidistant circles.

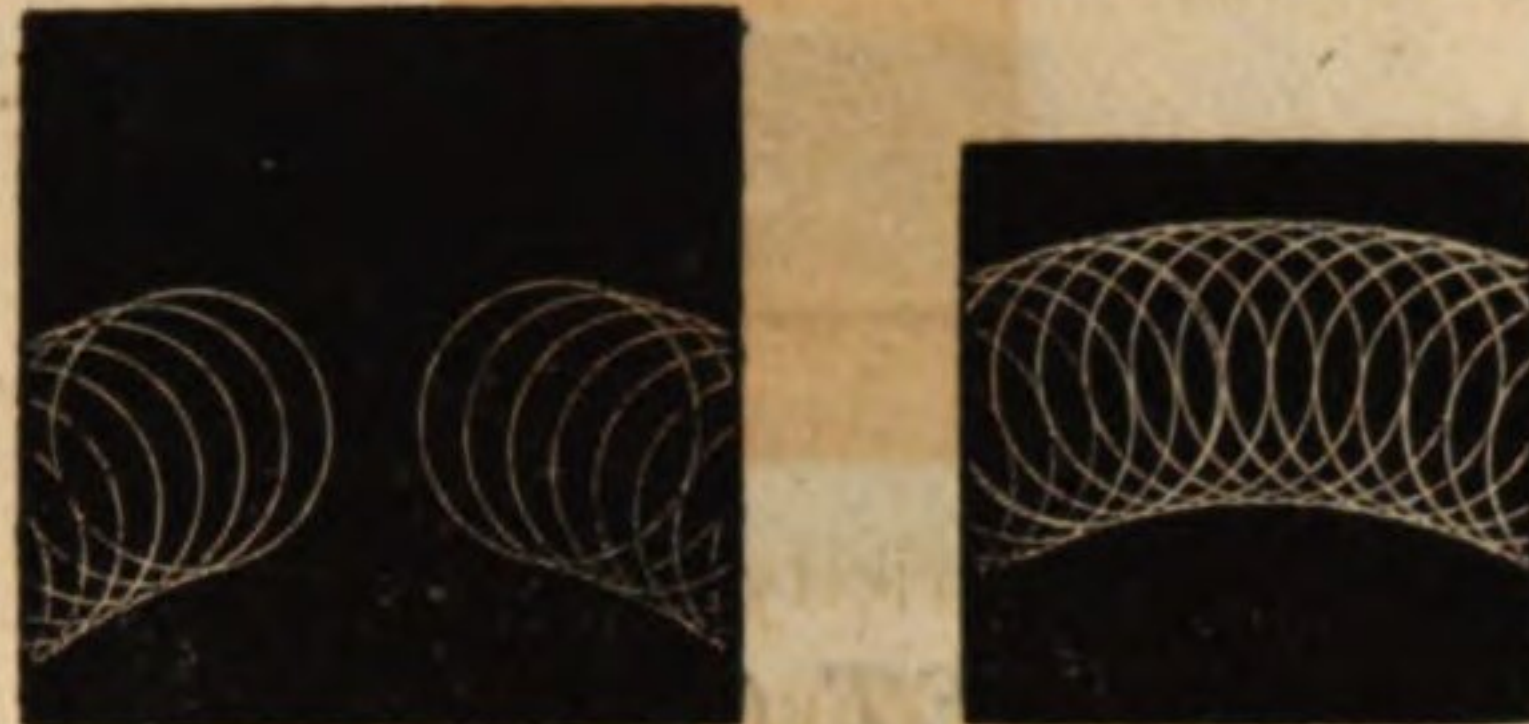
FOURTH SET OF CIRCLES.



Eccentricity equal to 3.

Radius equal to 16.

Proceed with the same angular tool, and, to produce the eccentricity for this set, turn the slide screw of the eccentric chuck forwards seven turns. To produce the radius, encrease the former radius by turning the slide rest screw backwards thirteen turns. Then describe twenty-four equidistant circles.

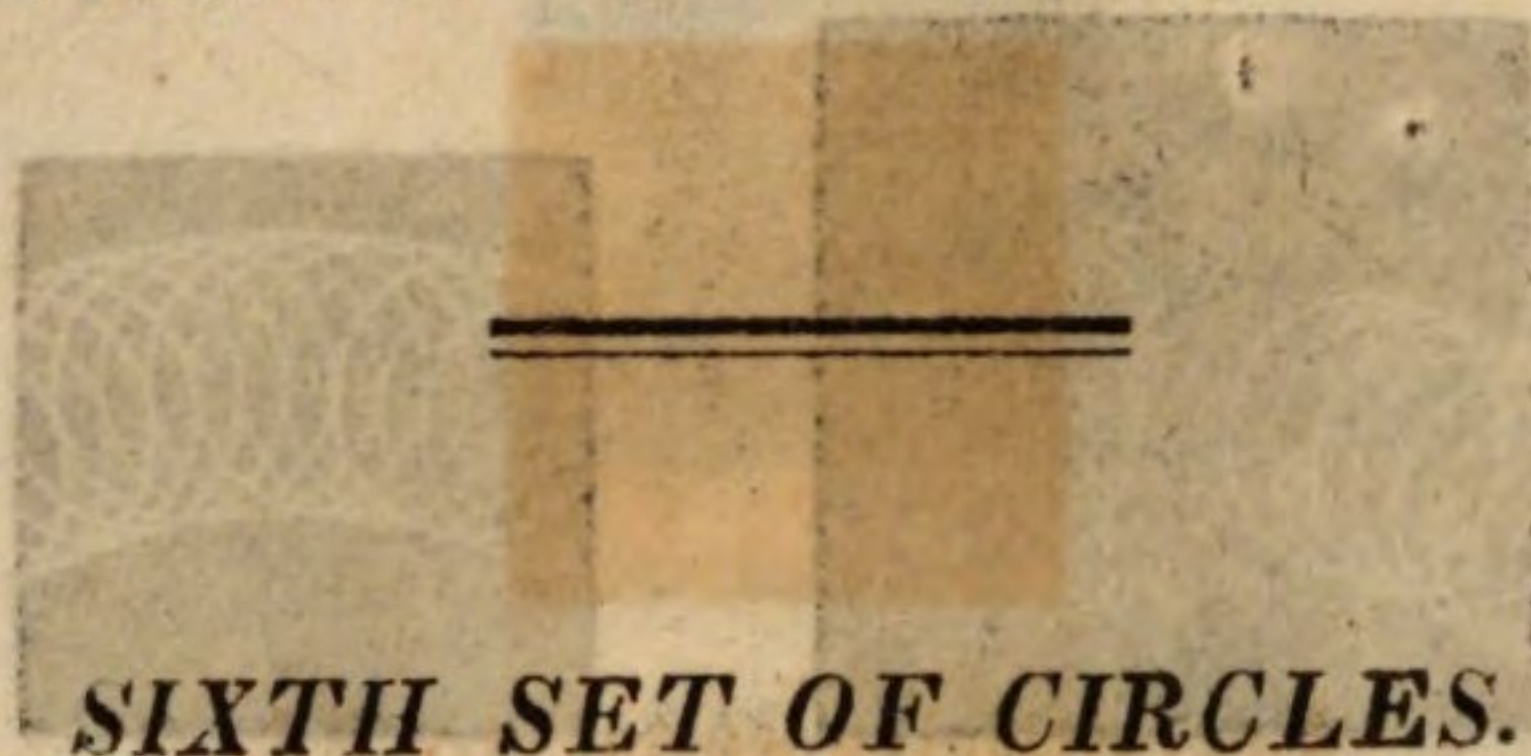
FIFTH SET OF CIRCLES.

Eccentricity equal to 23.

Radius equal to $4\frac{1}{2}$.

Continue with the same angular tool. The eccentricity is to be encreased by turning the slide screw of the eccentric chuck backwards twenty turns; and the radius is to be decreased by turning the slide rest screw forwards eleven turns and a half. Then (supposing the eccentric circle to be divided into ninety-six,) begin at eccentric division No. 96, and describe sixteen circles: miss eight divisions, set the eccentric circle to division No. 24, and describe sixteen more circles: miss eight divisions, set the eccentric circle to No. 48, and describe sixteen more circles: miss eight divisions, set the

eccentric circle to No. 72, and describe sixteen more circles.



Eccentricity equal to $29\frac{1}{2}$.

Radius equal to 2.

Change the angular tool to No. 25; which, before it is fixed in the slide rest, must be adjusted to the radius and depth of the circle last turned. The eccentricity is then to be encreased by turning the slide screw of the eccentric chuck backwards six turns and a half, and the radius is to be decreased by turning the slide rest screw forwards two turns and a half. Describe ninety-six equidistant circles.

SEVENTH SET OF CIRCLES.

Eccentricity equal to 33.

Radius equal to $\frac{5}{8}$.

Change the angular tool to No. 32; and, before it is fixed in the slide rest, adjust it to the radius of the circles last turned. The eccentricity is then to be encreased by turning the slide screw of the eccentric chuck backwards three turns and a half; and the radius is to be decreased by turning the slide rest screw forwards one and three-eighths of a turn. Describe two hundred and eighty-eight equidistant circles, not, however, of the depth of the circles previously turned, but of such a depth only as will just make the figures, which the tool leaves, sharp at top. Or, for common eccentric chucks, the following may be adopted.

SEVENTH SET OF CIRCLES.

ADAPTED TO AN ECCENTRIC DIVISION OF NINETY-SIX.

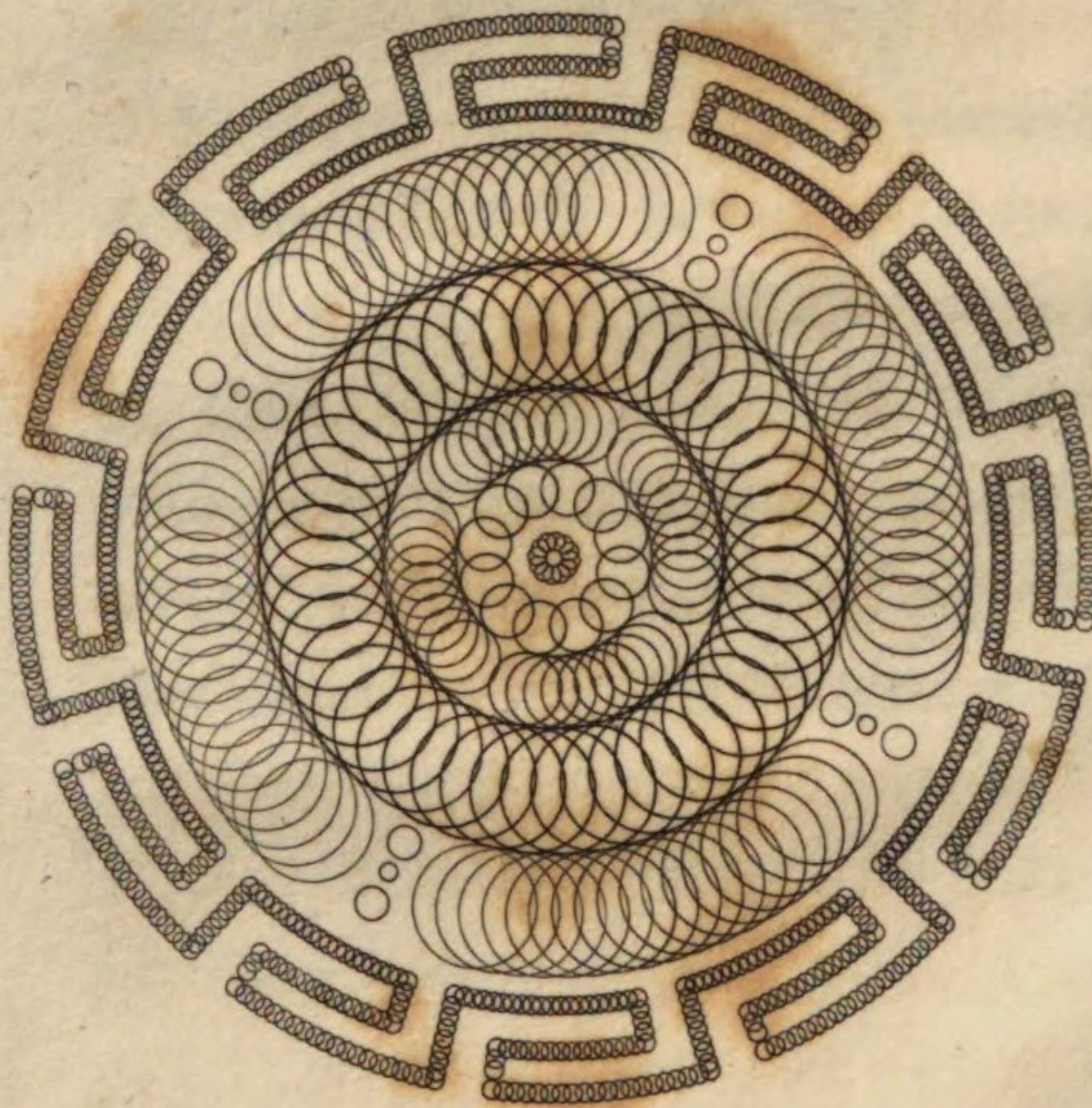


Eccentricity equal to 33.

Radius equal to 1.

Proceed exactly in the same manner as described for the set of two hundred and eighty-eight circles: the only difference is, that, in this set, the radius is to be made equal to one turn of the slide rest screw, and the number of equidistant circles must be limited to ninety-six.

PLATE II.



The divisions will now be produced by an eccentric circular division of two hundred and eighty-eight, and are formed into the figure of an Etruscan Border; but, as this high number of divisions cannot be obtained with the common eccentric chuck, a method is hereafter described, by which a Border, similar in figure, may be produced with an eccentric circular division of only ninety-six.

To produce a piece of Eccentric Circular Turning, similar to the pattern repre-

PLATE II



SCULPTURE

sent in Plate II, the following arrange-
ment must be minutely attended to.
The work, in the first instance, is to be
brought to a plane and polished surface;
and the eccentric circular division to be execu-
ted, with double angular tools, Nos. 28
and 29. Set the lathe at right angles
with the mandril of the lathe, and let it

SPECIMEN II.

THIS Specimen consists of seventeen sets of circles, of different eccentricities and radii, arranged round the common centre, in the manner represented in Plate II.

The exterior sets are produced by an eccentric circular division of two hundred and eighty-eight, and are formed into the figure of an Etruscan Border; but, as this high number of divisions cannot be obtained with the common eccentric chuck, a method is hereafter described, by which a Border, similar in figure, may be produced with an eccentric circular division of only ninety-six.

To produce a piece of Eccentric Circular Turning, similar to the pattern repre-

sented in Plate II, the following arrangement must be minutely attended to.

The work, in the first instance, is to be brought to a plane and polished surface ; and the eccentric circles are to be executed, with double angular tools, Nos. 28 and 36. Set the slide rest at right angles with the mandril of the lathe, and let it remain in that position until the work be completed. Fix an angular tool, No, 28, in the slide rest, and adjust its point, the eccentric chuck, and the slide rest, to the common centre, with the greatest possible correctness ; then proceed to execute the interior, or centre set of circles : these circles are not to be cut deep into the surface of the work ; but must be cut sufficiently so to leave the figures sharp at top.

FIRST SET OF CIRCLES.

Eccentricity equal to 1.

Radius equal to $\frac{1}{2}$.

To produce the eccentricity, turn the slide screw of the eccentric chuck backwards one turn. To produce the radius, turn the slide rest screw backwards half a turn. Describe twelve equidistant circles.

SECOND SET OF CIRCLES.

Eccentricity equal to 4.

Radius equal to $1\frac{1}{2}$.

To produce this eccentricity, encrease the former eccentricity by turning the

slide screw of the eccentric chuck backwards three turns; and to produce this radius, encrease the former radius by turning the slide rest screw backwards one turn; then, with the same tool as before, describe twelve equidistant circles. These circles must be cut considerably deeper than the first set of circles; rather more so than will be sufficient to leave the figure, which is formed by the intersection of the circles, sharp at top: but to whatever depth these circles are cut, the same depth must be preserved in all the sets of circles remaining to be executed; excepting those composing the border, regarding which mention will be hereafter made.

THIRD SET OF CIRCLES.



Eccentricity equal to $7\frac{1}{2}$.

Radius equal to 2.

Change the angular tool, and fix No. 36 in the slide rest; but, before it is fixed, adjust its point to the radius and depth of the circle last turned. Then produce the eccentricity by turning the slide screw of the eccentric chuck backwards three turns and a half; and produce the radius, by turning the slide rest screw backwards half a turn. Describe thirty-two circles at the following distances: *viz.* (supposing the circle of the eccentric chuck to be divided into ninety-six,) begin at division 96, and describe eight circles, one circle at every alternate succeeding division: miss eight succeeding divisions, set the eccentric circle at divi-

sion 24, and describe eight more circles, one circle at each alternate division: miss eight succeeding divisions, set the eccentric circle at division 48, and describe eight more circles, one circle at each alternate division: miss eight succeeding divisions, set the circle of the eccentric chuck at division 72, and describe eight circles as before.

FOURTH SET OF CIRCLES.



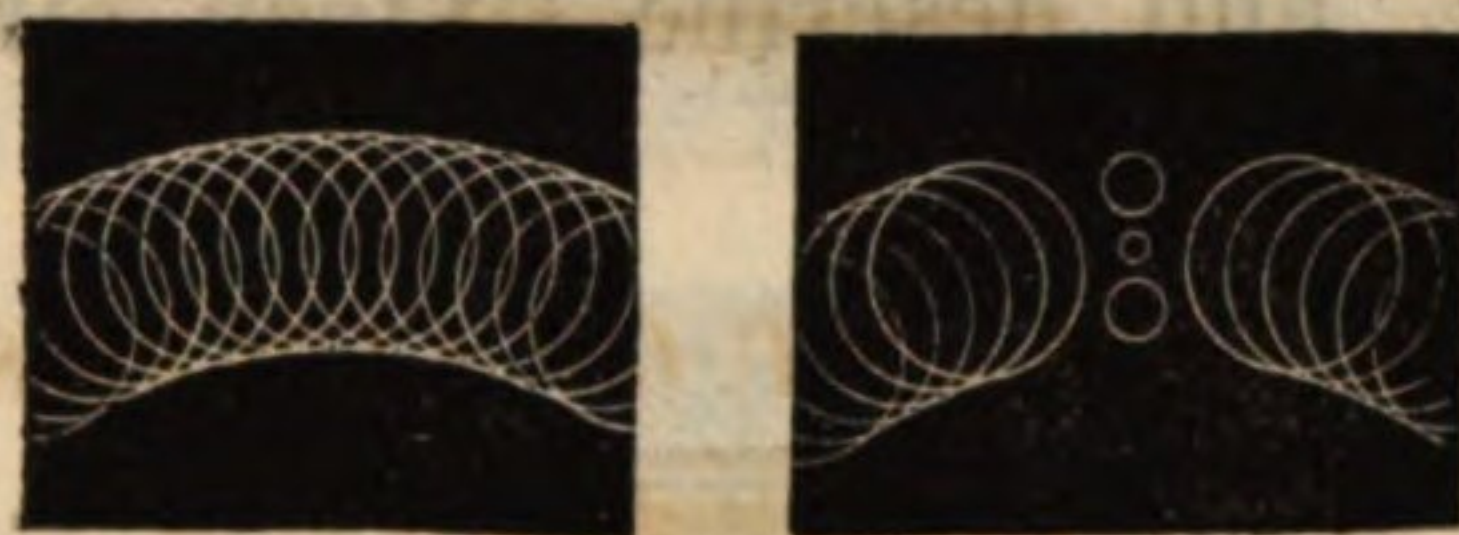
Eccentricity equal to 13.

Radius equal to $3\frac{1}{2}$.

Change the angular tool, and fix No. 28 in the slide rest; but, before it is fixed, adjust its point to the radius and depth of the circle last turned. Produce the eccentricity by turning the slide screw of

the eccentric chuck backwards five turns and a half. Produce the radius by turning the slide rest screw backwards one turn and a half. Then describe forty-eight equidistant circles.

FIFTH SET OF CIRCLES.



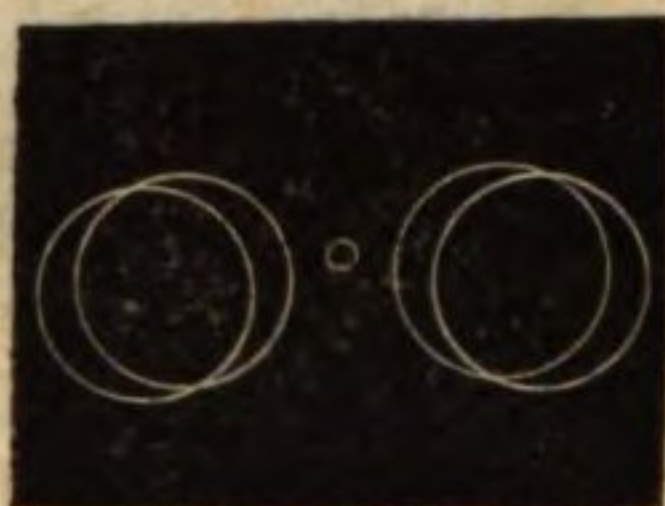
Eccentricity equal to $19\frac{3}{4}$.

Radius equal to $3\frac{1}{2}$.

Change the angular tool, and fix No. 36 in the slide rest; but, before it is fixed, adjust its point to the radius and depth of the circle last turned. The eccentricity is to be produced by turning the slide screw of the eccentric chuck backwards six turns and three-fourths: the radius remains as before. Describe sixty-four

circles, and arrange them in the following manner: *viz.* Set the eccentric circle at division 96, and describe sixteen circles, one circle at each following division: miss eight divisions, set the eccentric circle at division 24, and describe sixteen more circles: miss eight divisions, set the eccentric circle at division 48, and describe sixteen more circles: miss eight divisions, set the eccentric circle at division 72, and describe sixteen circles as before.

SIXTH SET OF CIRCLES.

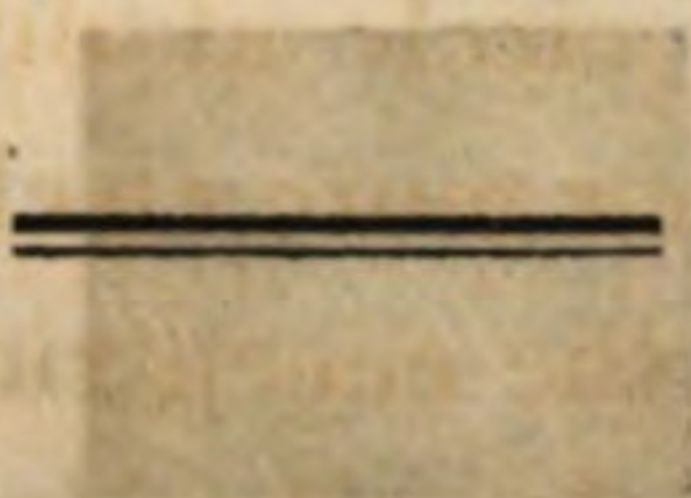


Eccentricity equal to $19\frac{1}{4}$.

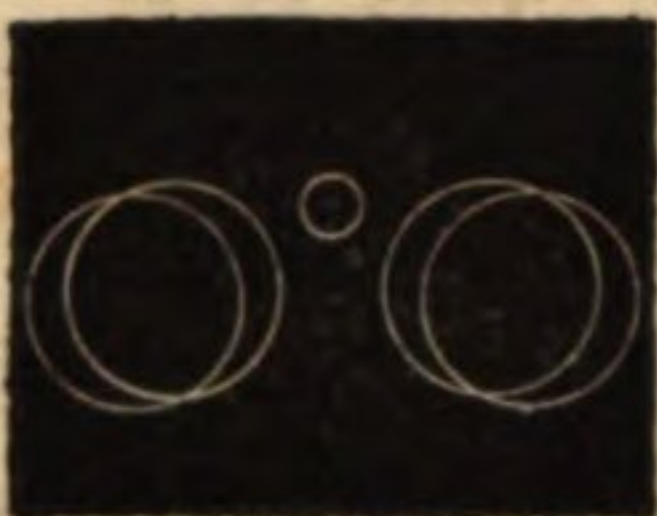
Radius equal to $\frac{1}{2}$.

Proceed with the same angular tool, No. 36, and with the same eccentricity.

Decrease the radius by turning the slide rest screw forwards three turns. Then (supposing the eccentric circle to be divided into ninety-six) describe four circles, one circle at each of the divisions undernamed: *viz.* at division 20, 44, 68, 92.



SEVENTH SET OF CIRCLES.



Eccentricity equal to $21\frac{1}{4}$.

Radius equal to 1.

Proceed with the same angular tool, No. 36. Encrease the eccentricity by turning the slide screw of the eccentric chuck backwards two turns; and encrease the radius by turning the slide rest screw backwards half a turn. Then

describe four circles, one circle at each of the following divisions, *viz.* at 20, 44, 68, 92.

EIGHTH SET OF CIRCLES.



Eccentricity equal to $17\frac{1}{4}$.

Radius equal to 1.

Proceed with the same angular tool, No. 36. Decrease the eccentricity by turning the eccentric slide screw forwards four turns; and, with the same radius as before, describe four circles, one at each of the following divisions, *viz.* 20, 44, 68, 92.

NINTH SET OF CIRCLES.

Eccentricity equal to 30.

Radius equal to $\frac{1}{2}$.

Change the angular tool, and fix No. 28 in the slide rest; but, before it is fixed, adjust its point to the radius of the circle last turned. The circles in this and the succeeding sets, which compose the Etruscan Border, are to be cut no deeper than will make the figures perfect at top.

Produce the eccentricity by turning the slide screw of the eccentric chuck backwards twelve turns and a quarter; and reduce the radius by turning the slide rest screw forwards half a turn.

The set of circles to be now produced, is the exterior of the nine sets which form the Etruscan Border. The circles in this set are two hundred and forty, which are to be described in the following manner: Set the circle of the eccentric chuck

(which is supposed to be divided into two hundred and eighty-eight) at division 5, and describe twenty circles, one circle at that and at each succeeding division: miss four divisions, set the circle of the eccentric chuck at division 29, and describe twenty circles as before: miss four divisions, set the circle of the eccentric chuck at division 53, and describe twenty more circles; and so on for the rest of this set, which, if correctly executed, will be completed by describing the last circle, in the last series of twenty, at division 288.

*TENTH SET OF CIRCLES.**

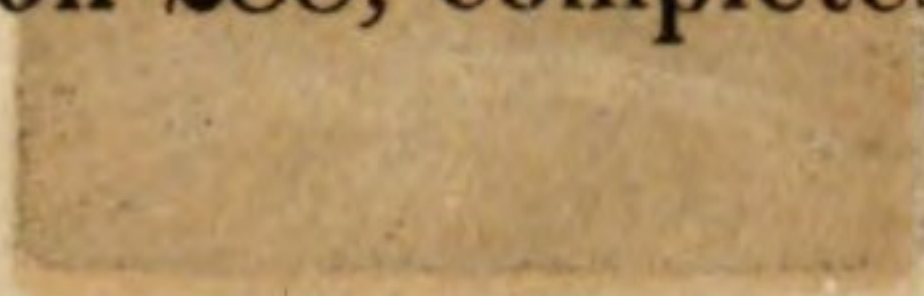
Eccentricity equal to $29\frac{3}{8}$.

Radius equal to $\frac{1}{2}$.

Proceed with the same angular tool and radius as before; and decrease the eccentricity by turning the eccentric slide screw forwards five-eighths of a turn. The circles in this set are twenty-four, and are to be described at the following distances. Set the circle of the eccentric chuck at division 5, and describe one circle: miss eighteen divisions, set the circle of the eccentric chuck at division 24, and describe one circle: miss four divisions, and describe one circle at the succeeding division; and so on, missing eighteen and four divisions alternately, and describing one circle at each division between those

* This and the following Illustrations exhibit the progress of the Etruscan Border; the lowermost circles being those which are to be produced.

two series, till the last circle being described at division 288, completes the set.



ELEVENTH SET OF CIRCLES.



Eccentricity equal to $28\frac{3}{4}$.

Radius equal to $\frac{1}{2}$.

Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards five-eighths of a turn; and then proceed, with the same angular tool and radius as before, to describe twenty-four circles in the same manner as directed for the tenth set.

TWELFTH SET OF CIRCLES.

Eccentricity equal to $28\frac{1}{8}$.

Radius equal to $\frac{1}{2}$.

Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards five-eighths of a turn; and proceed to describe twenty-four circles in the same manner as directed for the tenth set.

THIRTEENTH SET OF CIRCLES.

Eccentricity equal to $27\frac{1}{2}$.

Radius equal to $\frac{1}{2}$.

Proceed with the same angular tool and radius as before; and decrease the eccentricity by turning the slide screw of the

eccentric chuck forwards five-eighths of a turn. This set consists of one hundred and eighty circles, which are to be described in the following manner: Set the circle of the eccentric chuck at division 5, and describe fifteen circles, one circle at that and at each succeeding division: miss four divisions, set the circle of the eccentric chuck at division 24, and describe one circle: miss four divisions, set the circle of the eccentric chuck at division 29, and describe fifteen circles: and so on for the remaining divisions of this set.

FOURTEENTH SET OF CIRCLES.

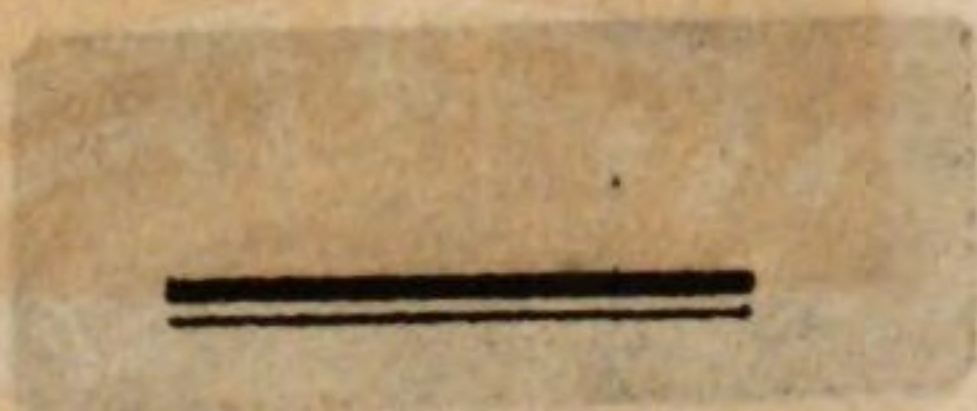
Eccentricity equal to $26\frac{7}{8}$.

Radius equal to $\frac{1}{2}$.

Proceed with the same angular tool and radius as before; and decrease the eccentricity by turning the slide screw of the eccentric chuck forwards five-eighths of a turn.

This set consists of twenty-four circles, which are to be described at the following distances: Set the circle of the eccentric chuck at division 288, and describe one circle: miss eighteen divisions, set the circle of the eccentric chuck at division 19, and describe one circle: miss four divisions, and describe one circle at the succeeding division: and so on, missing eighteen and four divisions alternately, and describing one circle at each division between those two series, till the last circle

being described at division 283, completes the set.



FIFTEENTH SET OF CIRCLES.



Eccentricity equal to $26\frac{1}{4}$.

Radius equal to $\frac{1}{2}$.

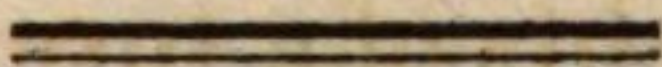
Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards five-eighths of a turn; and then proceed, with the same angular tool and radius as before, to describe twenty-four circles, in the same manner as directed for the fourteenth set.

SIXTEENTH SET OF CIRCLES.

Eccentricity equal to $25\frac{5}{8}$.

Radius equal to $\frac{1}{2}$.

Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards five-eighths of a turn; and then, with the same radius and angular tool as before, describe twenty-four circles at similar distances to those of the fourteenth set.

**SEVENTEENTH SET OF CIRCLES.**

Eccentricity equal to 25.

Radius equal to $\frac{1}{2}$.

Decrease the eccentricity by turning the slide screw of the eccentric chuck for-

wards five-eighths of a turn, and proceed with the same angular tool and radius as before. This set of circles completes the Etruscan Border, being the interior of the nine sets of which that Border is composed. There is the same number of circles in this as in the exterior or ninth set, *viz.* two hundred and forty, which are to be described in the following manner: Set the circle of the eccentric chuck at division 288, and describe twenty circles, one circle at that and at each succeeding division: miss four divisions, set the circle of the eccentric chuck at division 24, and describe twenty circles as before: miss four divisions, set the circle of the eccentric chuck at division 48, and describe twenty more circles: and so on for the rest of this set, which will be completed, if correctly executed, by the last circle, in the last series of twenty, being described at 283.

The labour attending the execution of Borders of this sort is very considerable,

particularly when they are composed of so minute a circular division as that just described. This alone will probably be sufficient to induce attention to correctness in placing the circles at their assigned distances; for it must be recollected that the omission of a circle would considerably injure the general effect, and a circle misplaced would totally spoil it.

By the following method an Etruscan Border, similar in figure to that which is represented in Plate II, may be produced with an eccentric circular division of only ninety-six. This Border consists of five sets of circles, which are to be cut sufficiently deep to make the figure perfect at top.

NINTH SET OF CIRCLES.

ADAPTED TO AN ECCENTRIC CIRCULAR DIVISION
OF NINETY-SIX.



Eccentricity equal to 33.

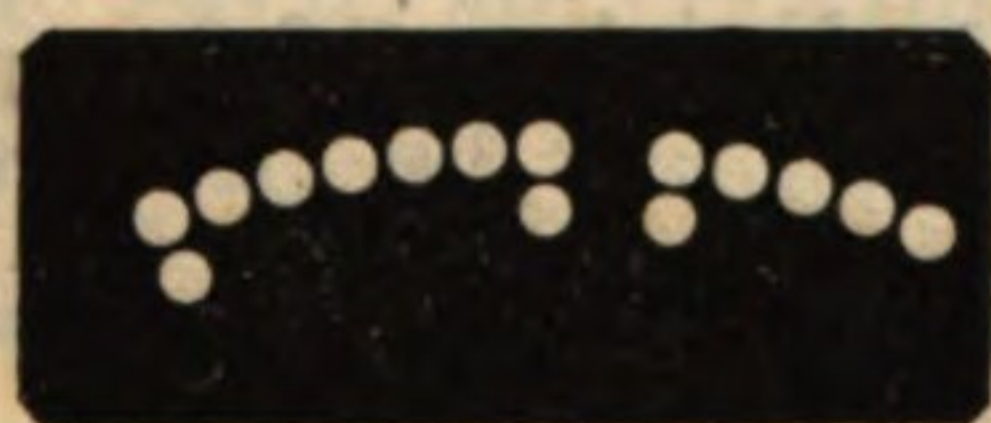
Radius equal to $\frac{7}{8}$.

Change the angular tool and fix No. 28 in the slide rest; but, before it is fixed, adjust its point to the radius of the circle last turned. Produce the eccentricity and radius, and make them greater than required for the ninth set, adapted to an eccentric division of two hundred and eighty-eight, by three turns backwards of the slide screw of the eccentric chuck, and three-eighths of a turn backwards of the slide rest screw.

This set of circles is the exterior of the five sets which are, now, to form the Etruscan Border: the number of circles in this set is eighty-four, which are to be described in the following manner.

Set the circle of the eccentric chuck (which is supposed to be divided into ninety-six) at division 2, and describe seven circles, one circle at that and at each succeeding division: miss one division, set the circle of the eccentric chuck at division 11, and describe seven circles as before: miss one division, set the circle of the eccentric chuck at division 19, and describe seven more circles: and so on for the rest of this set, which, if correctly executed, will be completed by describing the last circle, in the last series of seven, at division 96.

TENTH SET OF CIRCLES.



Eccentricity equal to $31\frac{1}{16}$.

Radius equal to $\frac{13}{16}$.

Proceed with the same angular tool as before. Decrease the eccentricity by

turning the slide screw of the eccentric chuck forwards one turn and fifteen-sixteenths of a turn. Decrease the radius by turning the slide rest screw forwards one-sixteenth of a turn. The circles in this set are twenty-four, which are to be described at the following distances: Set the circle of the eccentric chuck at division 2, and describe one circle: miss five divisions, set the circle of the eccentric chuck at division 8, and describe one circle: miss one division, set the circle of the eccentric chuck at division 10, and describe one circle: and so on, missing five divisions and one division alternately, and describing one circle at each intermediate division, till the last circle, being described at division 96, completes the set.

ELEVENTH SET OF CIRCLES.

Eccentricity equal to $29\frac{3}{16}$.

Radius equal to $\frac{3}{4}$.

Proceed with the same angular tool as before. Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards one turn and fourteen-sixteenths of a turn. Decrease the radius by turning the slide rest screw forwards one-sixteenth of a turn. There are seventy-two circles in this set, which are to be described in the following manner: Set the circle of the eccentric chuck at division 2, and describe five circles, one circle at that and at each succeeding division: miss one division, set the circle of the eccentric chuck at division 8, and describe one circle: miss one division, set the circle of the eccentric chuck at division 10, and describe five circles: and so on, till this set be completed.

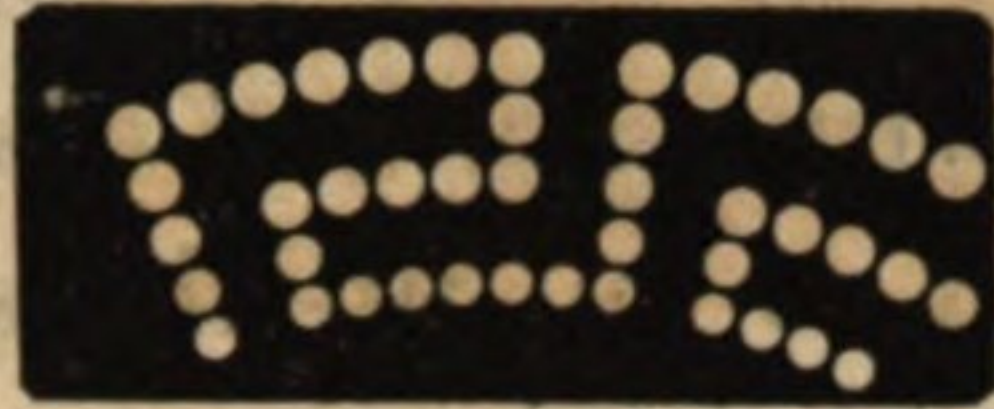
TWELFTH SET OF CIRCLES.

Eccentricity equal to $27\frac{6}{16}$.

Radius equal to $\frac{11}{16}$.

The same angular tool as before. Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards one turn and thirteen-sixteenths of a turn. Decrease the radius by turning the slide rest screw forwards one-sixteenth of a turn. This set consists of twenty-four circles, which are to be described at the following distances: Set the circle of the eccentric chuck at division 96, and describe one circle: miss five divisions, set the circle of the eccentric chuck at division 6, and describe one circle: miss one division, and describe one circle at the succeeding division: and so on, missing five divisions and one division alternately, and describing one circle at the intermediate divisions, till the set be completed.

THIRTEENTH SET OF CIRCLES.



Eccentricity equal to $25\frac{3}{4}$.

Radius equal to $\frac{3}{4}$.

Decrease the eccentricity by turning the slide screw of the eccentric chuck forwards one turn and ten-sixteenths of a turn. Decrease the radius by turning the slide rest screw forwards one-sixteenth of a turn; then proceed with the same angular tool as before. This set of circles completes the Etruscan Border, adapted to an eccentric circular division of ninety-six. It consists of as many circles as the exterior set, *viz.* eighty-four, which are to be described in the following manner: Set the circle of the eccentric chuck at division 96, and describe seven circles, one circle at that and at each succeeding division: miss one division, set the circle of the eccentric chuck at division 8, and

describe seven circles as before: miss one division, set the circle of the eccentric chuck at division 16, and describe seven circles: and so on, till the set be completed at division 94.

PLATE III

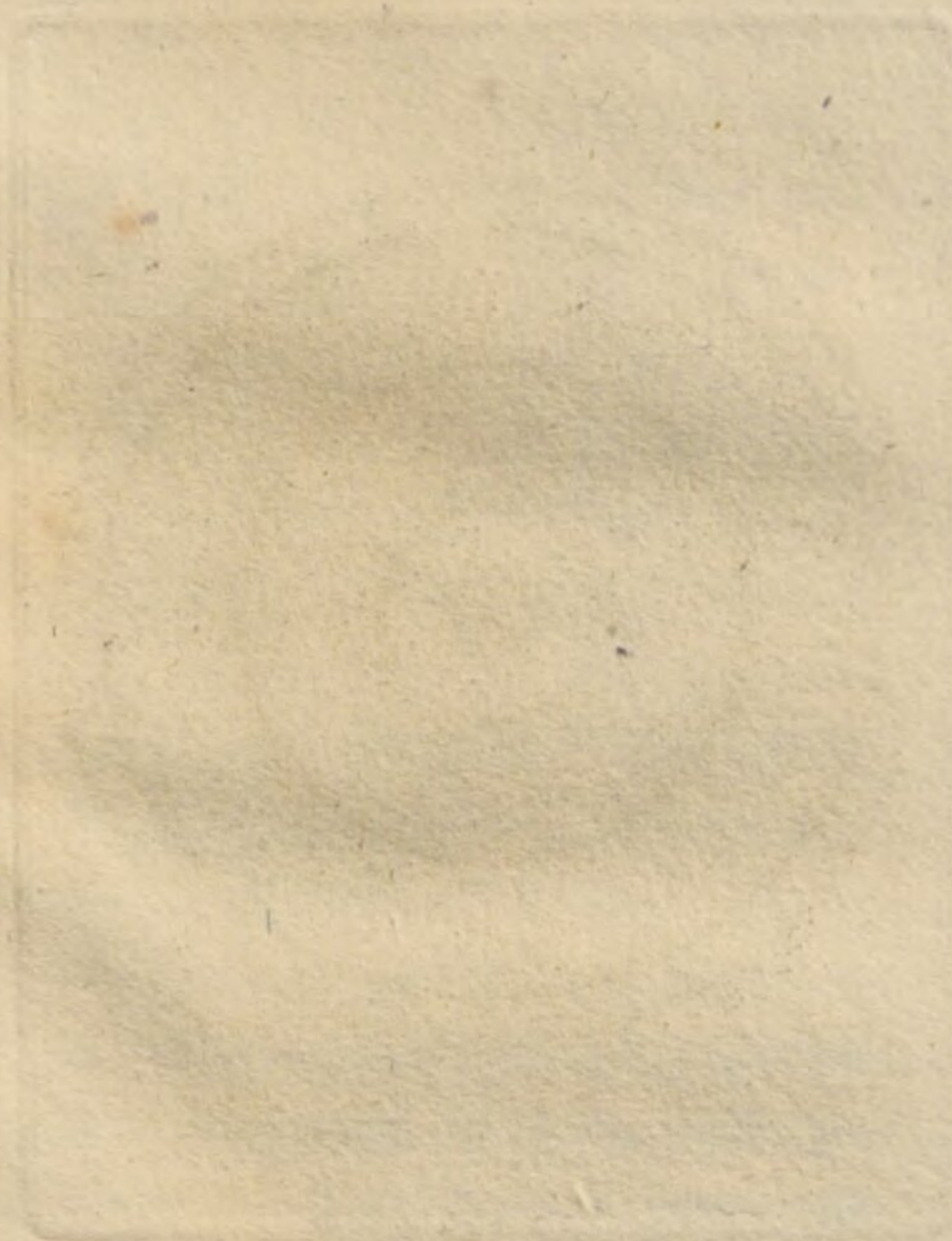
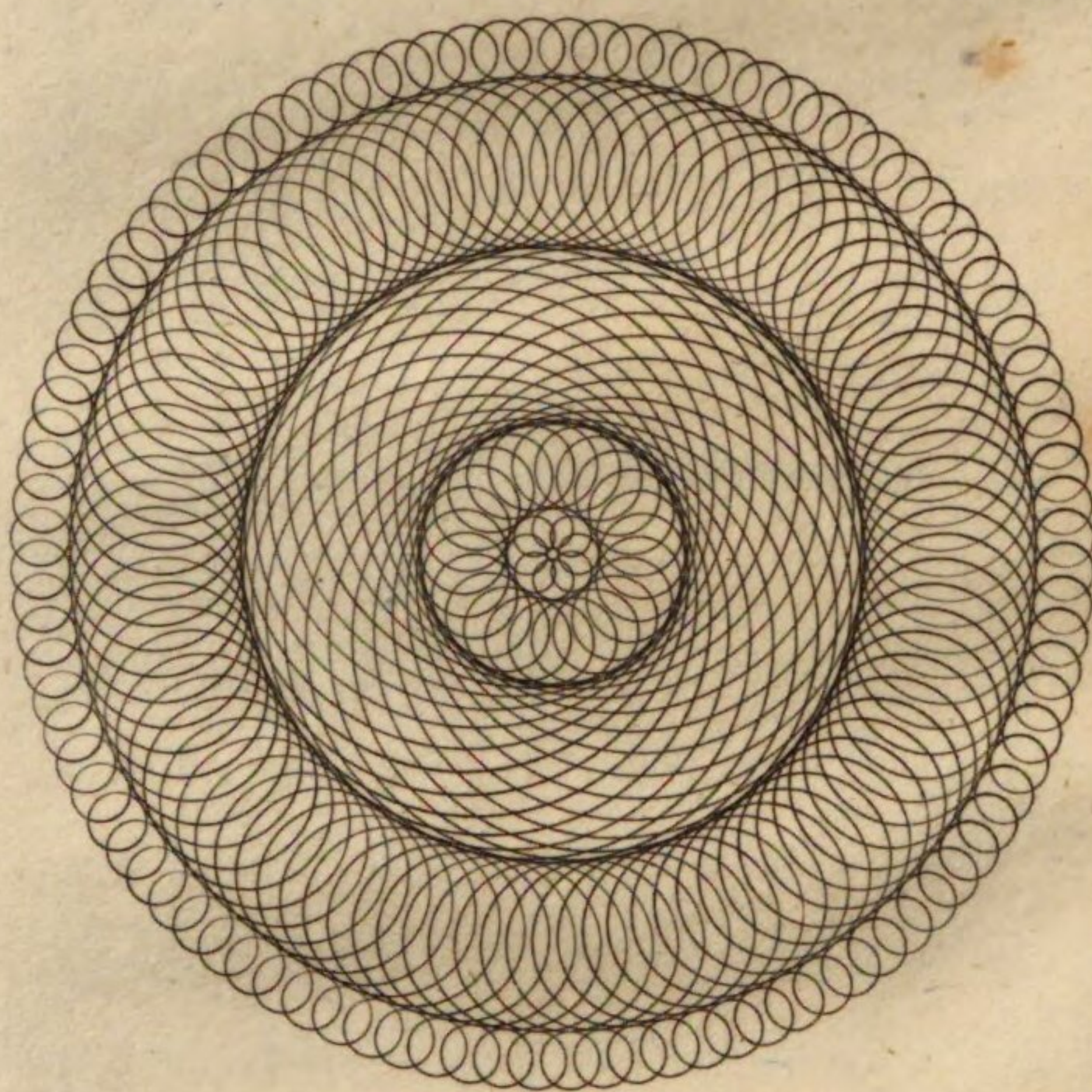


PLATE III.

2

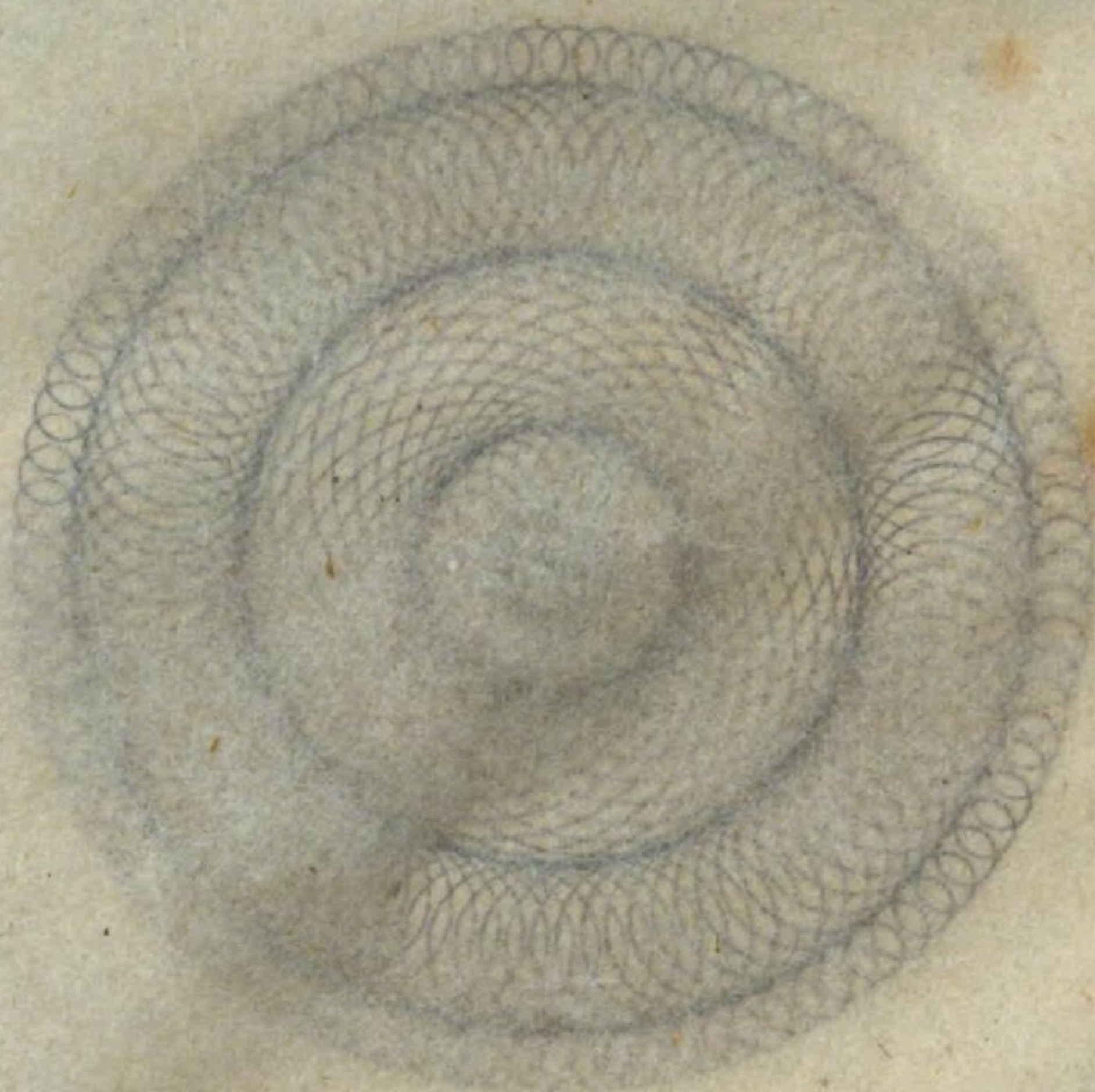


SPECIMEN III.

This Specimen is composed of five sets of circles, of various radii, which are arranged round the common centre, at different intervals, the number represented in the following table. By reference to this table, and the following data, the Turner will be enabled to produce a corresponding piece of Turning.

The tools to be used are double angular, Nos. 28 and 36; and the slide rest is to be set at right angles with the mandrel of the lathe. The work to be turned (being first properly fixed in the eccentric chuck) must be brought to a plane and polished surface: then fix the angular tool No. 36 in the slide rest; and, after

PLATE III.



SPECIMEN III.

—♦—♦—♦—

THIS Specimen is composed of five sets of circles, of various radii, which are arranged round the common centre, at different eccentricities, in the manner represented in the accompanying Plate (III): by reference to this Plate, aided by the following data, the Turner will be enabled to produce a corresponding piece of Turning.

The tools to be used are double angular, Nos. 28 and 36; and the slide rest is to be set at right angles with the mandril of the lathe. The work to be turned (being first properly fixed in the eccentric chuck) must be brought to a plane and polished surface: then fix the angular tool No. 36 in the slide rest; and, after

adjusting its point, the eccentric chuck, and the slide rest, to the common centre, with the greatest possible correctness, proceed to execute the centre, or interior set of circles.

FIRST SET OF CIRCLES.

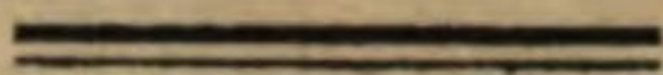


Eccentricity equal to $1\frac{1}{4}$.

Radius equal to $1\frac{1}{8}$.

Produce the eccentricity by turning the slide screw of the eccentric chuck backwards one turn and a quarter. Produce the radius by turning the slide rest screw backwards one turn and an eighth of a turn. Then describe eight equidistant circles: these circles are to be cut sufficiently deep to make the figure, which is

left by the intersection of the circles, sharp at top ; and the same depth must be preserved throughout all the other sets.



SECOND SET OF CIRCLES.



Eccentricity equal to $4\frac{1}{2}$.

Radius equal to $2\frac{1}{8}$.

To obtain the eccentricity turn the slide screw of the eccentric chuck backwards three turns and a quarter. To obtain the radius turn the slide rest screw backwards one turn. Then, with the same angular tool as before, describe twenty-four equidistant circles.

THIRD SET OF CIRCLES.

Eccentricity equal to $5\frac{1}{8}$.

Radius equal to $11\frac{3}{4}$.

Produce the eccentricity by turning the slide screw of the eccentric chuck backwards five-eighths of a turn. Produce the radius by turning the slide rest screw backwards nine turns and five-eighths of a turn. Then, with the same tool, No. 36, as before, describe twenty-four equidistant circles.

FOURTH SET OF CIRCLES.



Eccentricity equal to $21\frac{1}{2}$.

Radius equal to $4\frac{3}{4}$.

Change the angular tool, and fix No. 28 in the slide rest; but, before it is fixed, adjust its point to the radius and depth of the circle last turned. To produce the eccentricity add to that required for the preceeding set, by turning the slide screw of the eccentric chuck backwards sixteen turns and three-eighths of a turn. To produce the radius decrease that which was required for the preceeding set, by turning the slide rest screw forwards seven turns. Describe ninety-six equidistant circles.

FIFTH SET OF CIRCLES.

Eccentricity equal to $27\frac{3}{4}$.

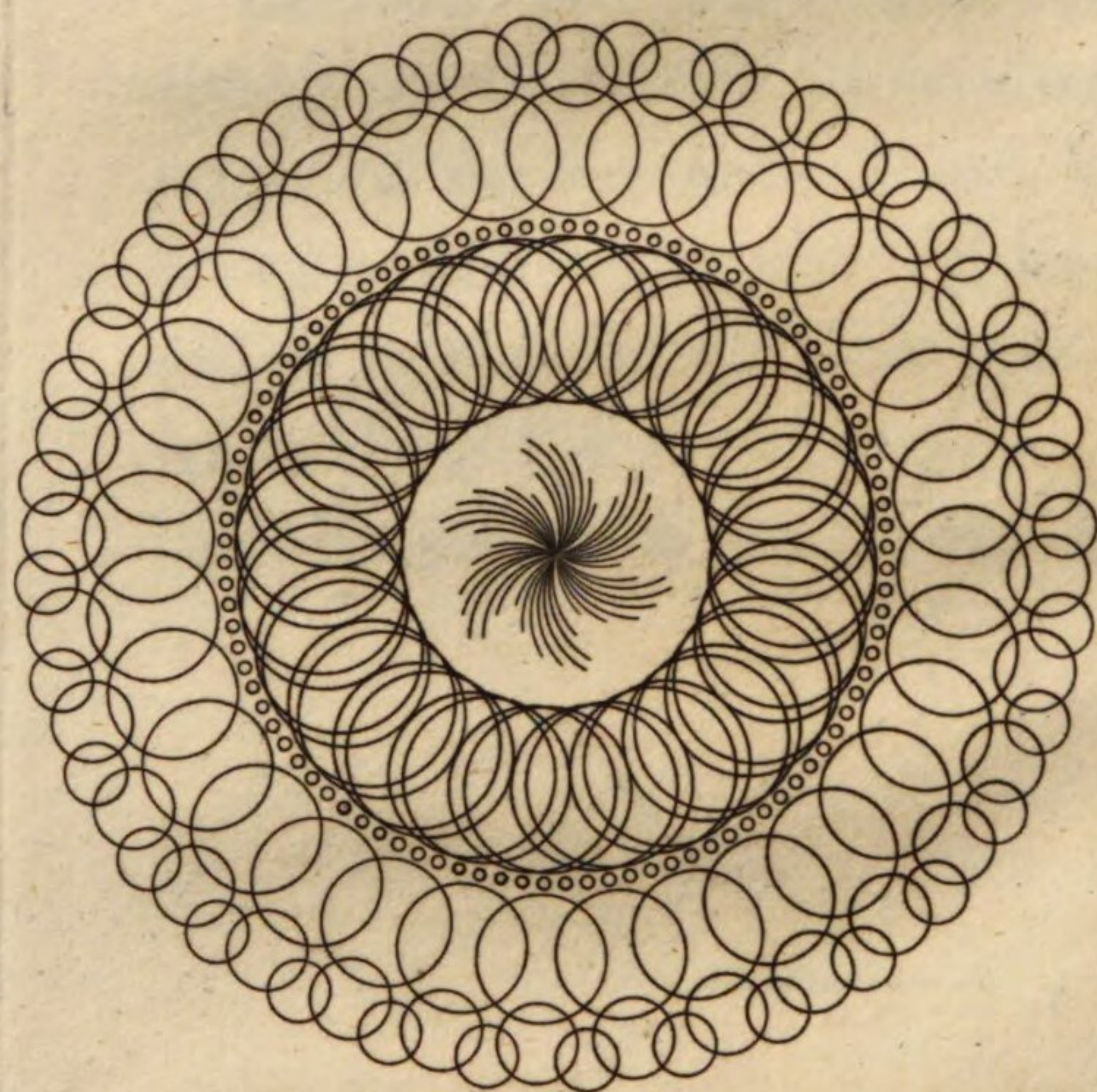
Radius equal to $1\frac{1}{2}$.

Encrease the eccentricity required for the set last described, by turning the slide screw of the eccentric chuck backwards six turns and a quarter; and decrease the radius by turning the slide rest screw forwards three turns and a quarter. Then describe ninety-six equidistant circles.

PLATE IV.



PLATE IV.

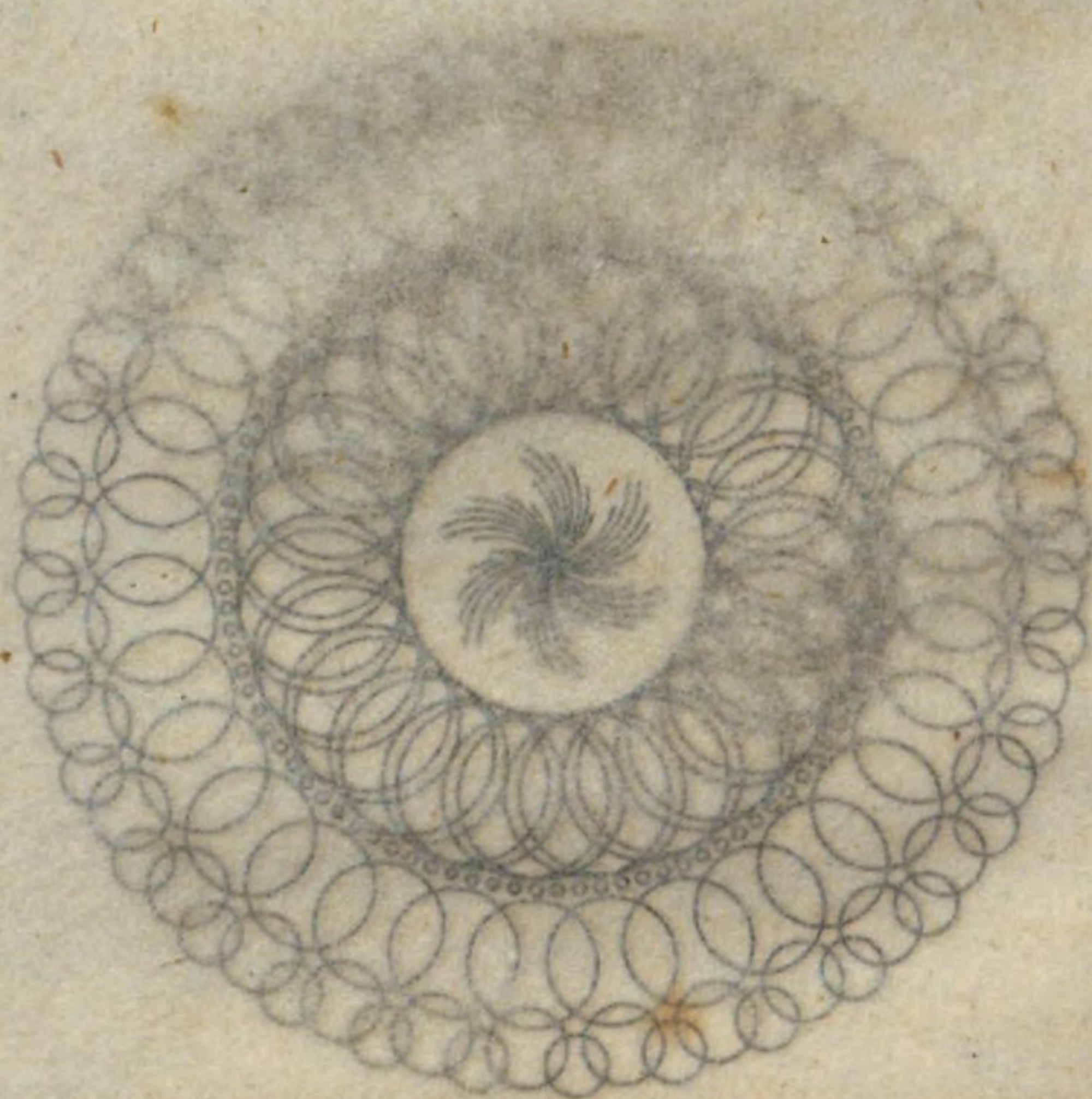


The circles represent the arcs of the sets of
lathe wheels, which form the eccentric figures,
and the arcs of circles are turned on the lathe.
The circles represent the arcs of the sets of
lathe wheels, which form the eccentric figures,
and the arcs of circles are turned on the lathe.
The circles represent the arcs of the sets of
lathe wheels, which form the eccentric figures,
and the arcs of circles are turned on the lathe.

The arcs of circles, all of the same radius
and centre, are produced from the point of the common centre, but vary
in their pressure. Plate IV represents the
arrangement of these circles and arcs;
which, together with the following prac-
tical directions, will enable the workman
to execute a corresponding piece of Ec-
centric Turning.

in order to understand the description,
hereafter given, of the method by which

PLATE IV.



SPECIMEN IV.

—♦—

THIS Specimen consists of five sets of circles, which form the outermost figures, and of five sets of arcs of circles, or curved lines, which form the centre figure. The circles are of different radii, and are arranged, at different eccentricities, round the common centre. The arcs of circles, or curved lines, are all of the same radius and eccentricity, and are produced from the point of the common centre, but vary in their measure. Plate IV represents the arrangement of these circles and arcs; which, together with the following practical directions, will enable the workman to execute a corresponding piece of Eccentric Turning.

In order to understand the description, hereafter given, of the method by which

the arcs of circles, or curved lines, are to be produced, the following observations must be attended to.

It must be recollected, that, in Eccentric Turning, all circles and arcs of circles, are produced by the rotatory motion of the lathe; that the radius of all circles, and of all arcs of circles, is produced by the slide rest; and that the locality, or what is called eccentricity in this kind of Turning, of all circles, and of all arcs of circles, is assigned to them by the operation of the eccentric chuck. If a tool, therefore, be applied to the surface of the work, at any point without the centre of the lathe's motion, and the pulley wheel, which gives motion to the mandril of the lathe, be moved completely round, a circle will be described: if the pulley wheel be moved but half round, the tool will describe a semicircle, or an arc of 180 degrees: and if the pulley wheel be moved but a quarter round, the tool will describe an arc of a qua-

drant, or 90 degrees. The pulley wheel, which gives motion to the mandril of the lathe, affords, consequently, the practical means of measuring all arcs, or curved lines; and it will give their measure both minutely and correctly, if a circle on the face of it be divided into some convenient number of parts. For instance, suppose such circle were divided into forty-eight parts, and that to produce an arc, or curved line, the said pulley wheel be moved forwards twelve of those parts, the measure of the arc, or curved line, thereby produced, would be equal to $\frac{12}{48}$; if the pulley wheel be moved twenty-four divisions, the measure of the curve would be equal to $\frac{24}{48}$, &c. &c. It is on this principle that the curved lines, in question, are produced; and that the measure of them is defined.

The work to be turned must be fixed in the eccentric chuck, and brought to a plane and polished surface; a double angular tool, No. 32, may be used through-

out this piece of Eccentric Turning; and the slide rest is to be set at right angles with the mandril of the lathe.

Fix the angular tool in the slide rest, and adjust its point, the eccentric chuck, and the slide rest, to the common centre, with every possible degree of correctness. In this state of things, move the lathe round, and pressing the point of the angular tool gently against the surface of the work, describe a very minute dot; from which dot all the curved lines, which form the centre figure, are to be produced, in the following manner.

FIRST SET OF ARCS.

Eccentricity equal to 5.

Radius equal to 5.

Measure of the arcs $\frac{1}{4}\frac{2}{8}$.

Produce the eccentricity and radius by turning the slide screw of the eccentric chuck and the slide rest screw backwards five turns each. Set the circle of the eccentric chuck at division 96, turn round the mandril pulley wheel until the dot, at the common centre, comes under the point of the tool; and then, setting the point of the tool in this dot, describe a curved line by moving the pulley wheel forwards (supposing it to be divided into 48) twelve divisions.* Then describe five

* It would tend very greatly to the correct execution of this centre figure, if stops were to be applied to the pulley wheel, so as to secure it from moving, either way, beyond the intended limits of the curve.

other arcs, or curved lines, one at each of the following divisions of the circle of the eccentric chuck, 16, 32, 48, 64, 80.

SECOND SET OF ARCS.*



Eccentricity equal to 5.

Radius equal to 5.

Measure of the arcs $\frac{11}{48}$.

These arcs, or curved lines, are to be produced from the centre dot, in the same manner as those of the former set, but the pulley wheel is to be moved only eleven divisions. There are twelve curved lines of this measure to be described, one at

* In this and the following illustrations of the arcs, the lines which meet at the centre are those which are to be produced.

each of the under-named divisions of the circle of the eccentric chuck, viz. 2, 14, 18, 30, 34, 46, 50, 62, 66, 78, 82, 94.

THIRD SET OF ARCS.



Eccentricity equal to 5.

Radius equal to 5.

Measure of the arcs $\frac{10}{48}$.

Produce six arcs, one at each of the following divisions of the circle of the eccentric chuck, viz. 4, 20, 36, 52, 68, 84.

FOURTH SET OF ARCS.

Eccentricity equal to 5.

Radius equal to 5.

Measure of the arcs $\frac{8}{48}$.

Produce six arcs, one at each of the following divisions of the circle of the eccentric chuck, *viz.* 6, 22, 38, 54, 70, 86.

FIFTH SET OF ARCS.


Eccentricity equal to 5.

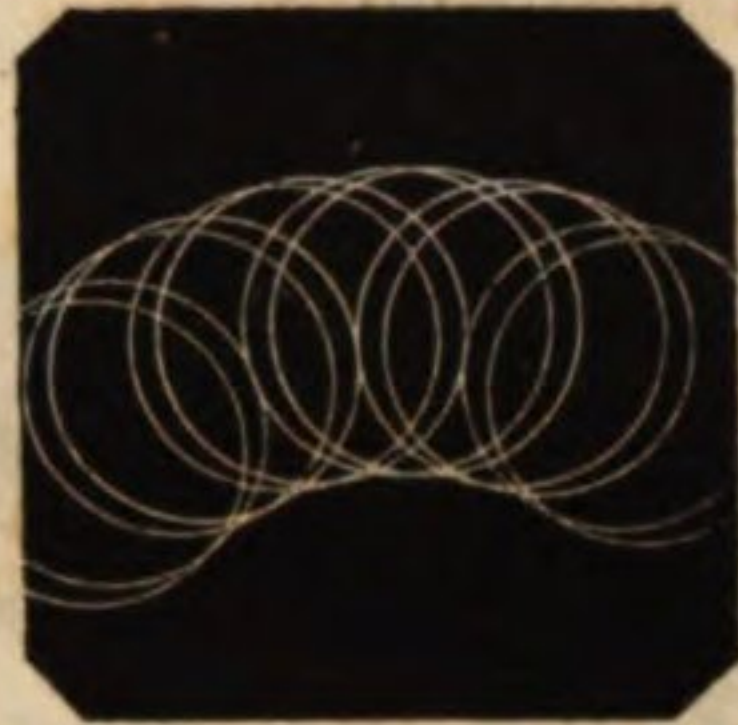
Radius equal to 5.

Measure of the arcs $\frac{7}{48}$.

Produce twelve arcs, one at each of the following divisions of the circle of the

eccentric chuck. *viz.* 8, 12, 24, 28, 40, 44, 56, 60, 72, 76, 88, 92.

FIRST SET OF CIRCLES.



Eccentricity equal to $14\frac{1}{8}$.

Radius equal to 5.

Proceed with the same angular tool and radius as before. Encrease the eccentricity by turning the slide screw of the eccentric chuck backwards nine turns and one-eighth of a turn; and then (supposing the circle of the eccentric chuck to be divided into 96) produce forty-eight circles in the following manner: *viz.*

Describe one circle at division 96: set the circle of the eccentric chuck at divi-

sion 1, and describe another circle: miss two divisions, set the circle of the eccentric chuck at division 4, and describe a circle: set the circle of the eccentric chuck at division 5, and describe another circle; and so on, missing every alternate two divisions, till the forty-eight circles be completed.

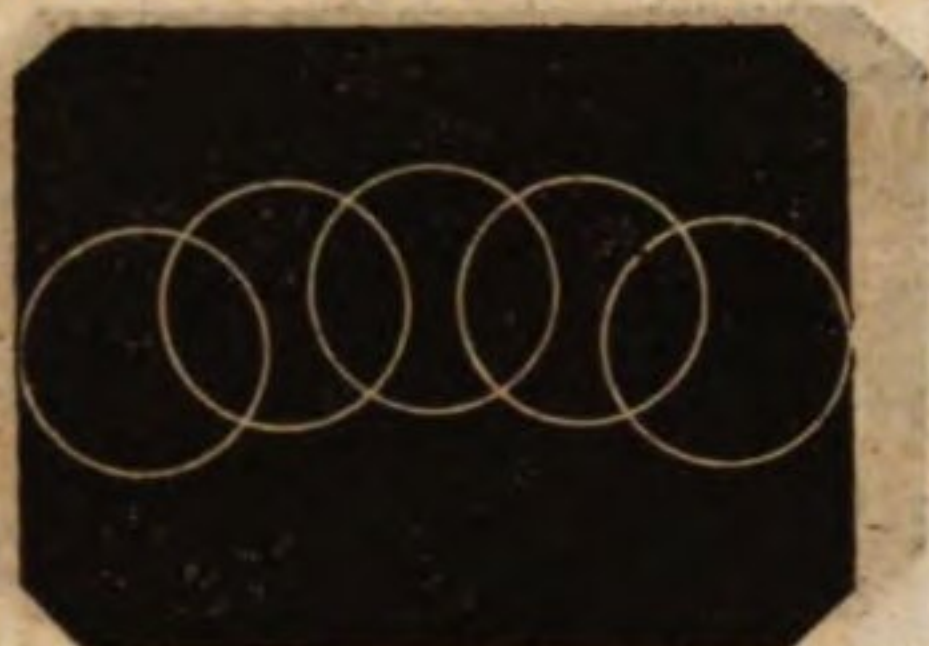
SECOND SET OF CIRCLES.



Eccentricity equal to $19\frac{3}{4}$.

Radius equal to $\frac{1}{2}$.

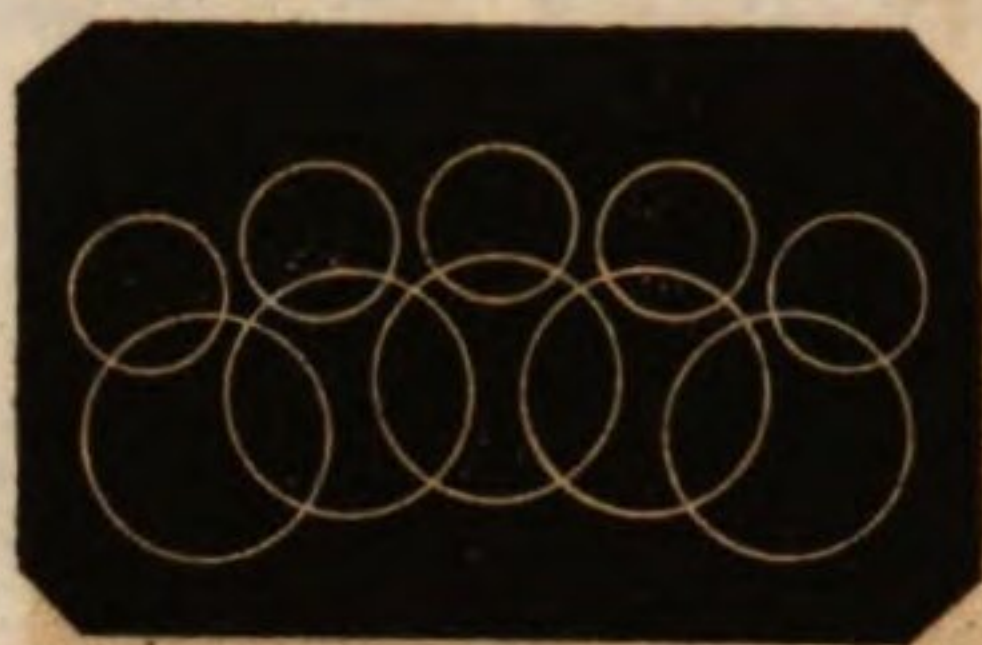
The same angular tool as before. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards five turns and five-eighths of a turn. Produce the radius by turning the slide rest screw forwards four turns and a half. Describe ninety-six equidistant circles.

THIRD SET OF CIRCLES.

Eccentricity equal to $24\frac{1}{2}$.

Radius equal to 4.

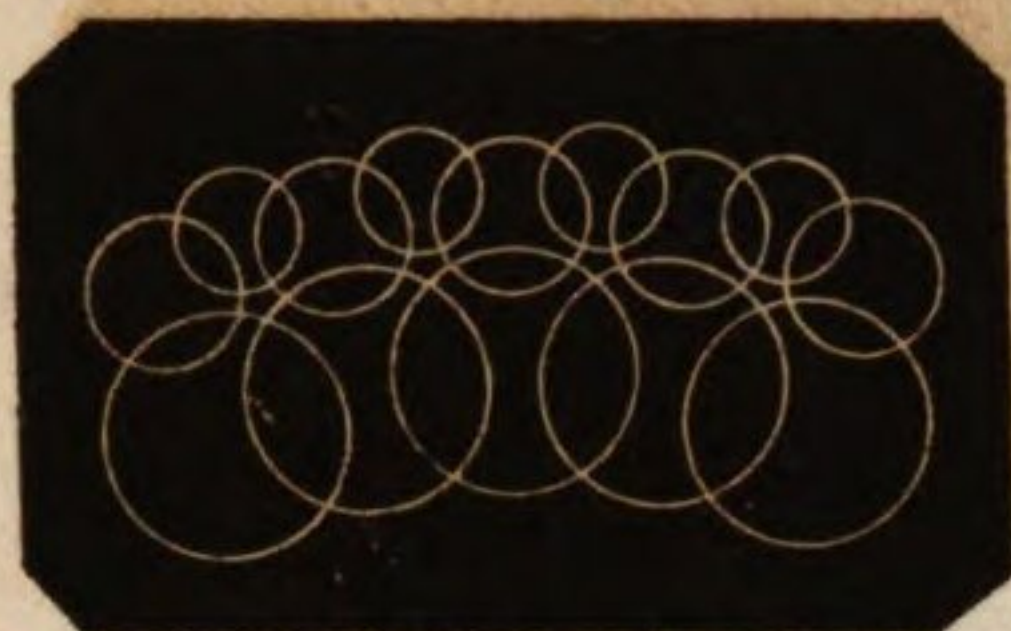
The same angular tool as before. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards four turns and three-fourths of a turn. Produce the radius by turning the slide rest screw forwards three turns and a half. Describe thirty-two equidistant circles.

FOURTH SET OF CIRCLES.

Eccentricity equal to $29\frac{1}{2}$.

Radius equal to $2\frac{1}{2}$.

The same angular tool as before. En-
crease the eccentricity by turning the
slide screw of the eccentric chuck back-
wards five turns. Decrease the radius by
turning the slide rest screw forwards one
turn and a half. Describe thirty-two
equidistant circles.

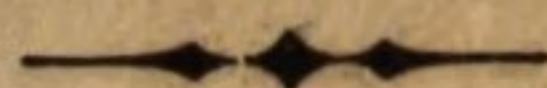
FIFTH SET OF CIRCLES.

Eccentricity equal to $30\frac{1}{2}$.

Radius equal to 2.

The same angular tool as before. Encrease the eccentricity by turning the slide screw of the eccentric chuck backwards one turn. Decrease the radius by turning the slide rest screw forwards half a turn. Describe thirty-two equidistant circles: these circles are not to be produced at the divisions of the circle of the eccentric chuck adopted in the third and fourth sets, but midway between those divisions.

SPECIMEN V.



THIS Specimen is composed of a number of concentric circles, and of arcs of circles, which cross each other in the manner represented in the accompanying Plate (V). The concentric circles increase in radius, in a uniform ratio from the common centre: the arcs of circles are all of the same measure, and are produced, not from the point of the common centre, but from points equidistant from it.

The tool to be used, to produce a piece of Eccentric Turning corresponding with this Specimen, is double angular No. 28, and the slide rest is to be set at right angles with the mandril of the lathe.

The work to be turned, being properly fixed in the eccentric chuck, is to be

PLATE 7.

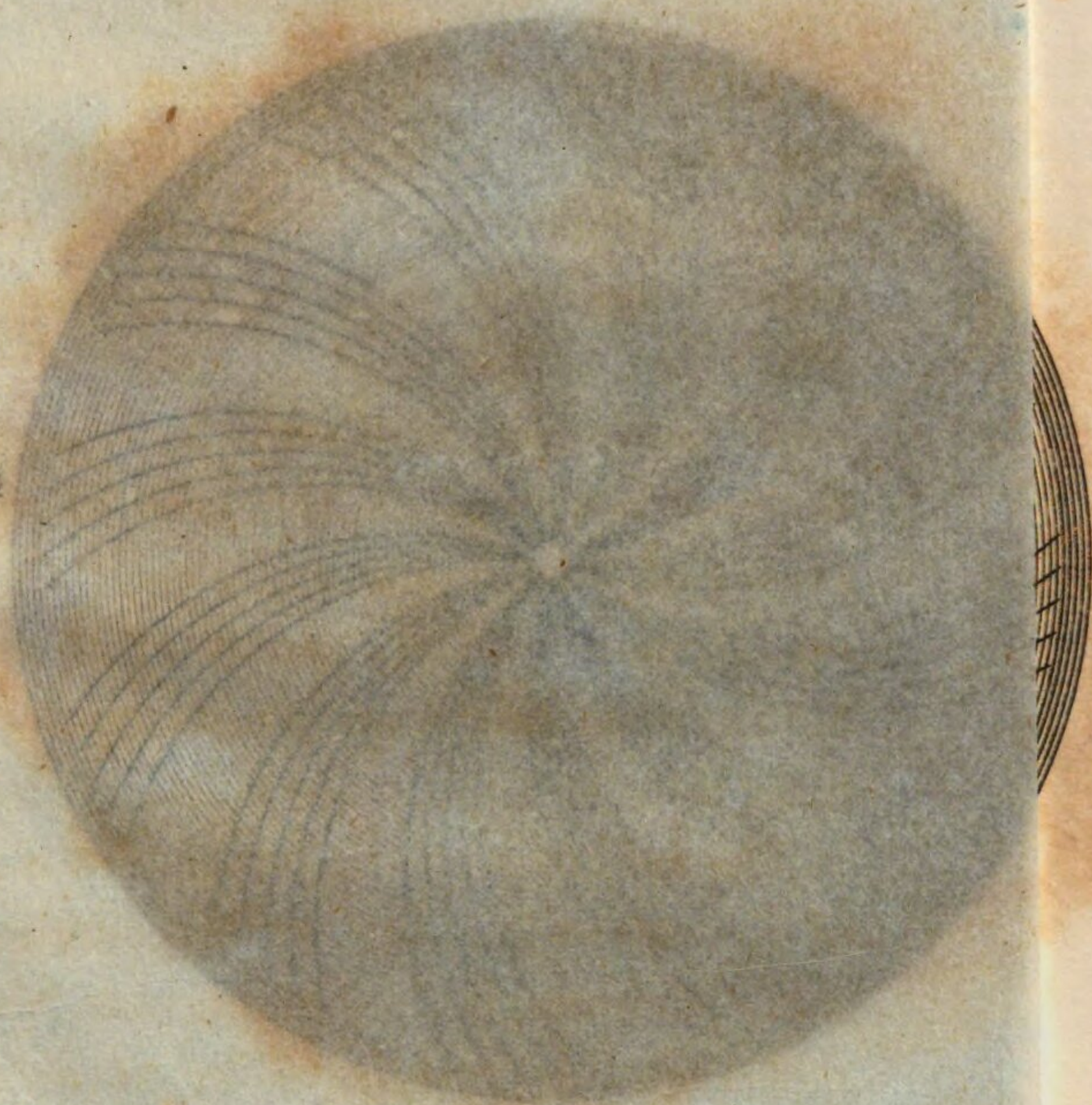
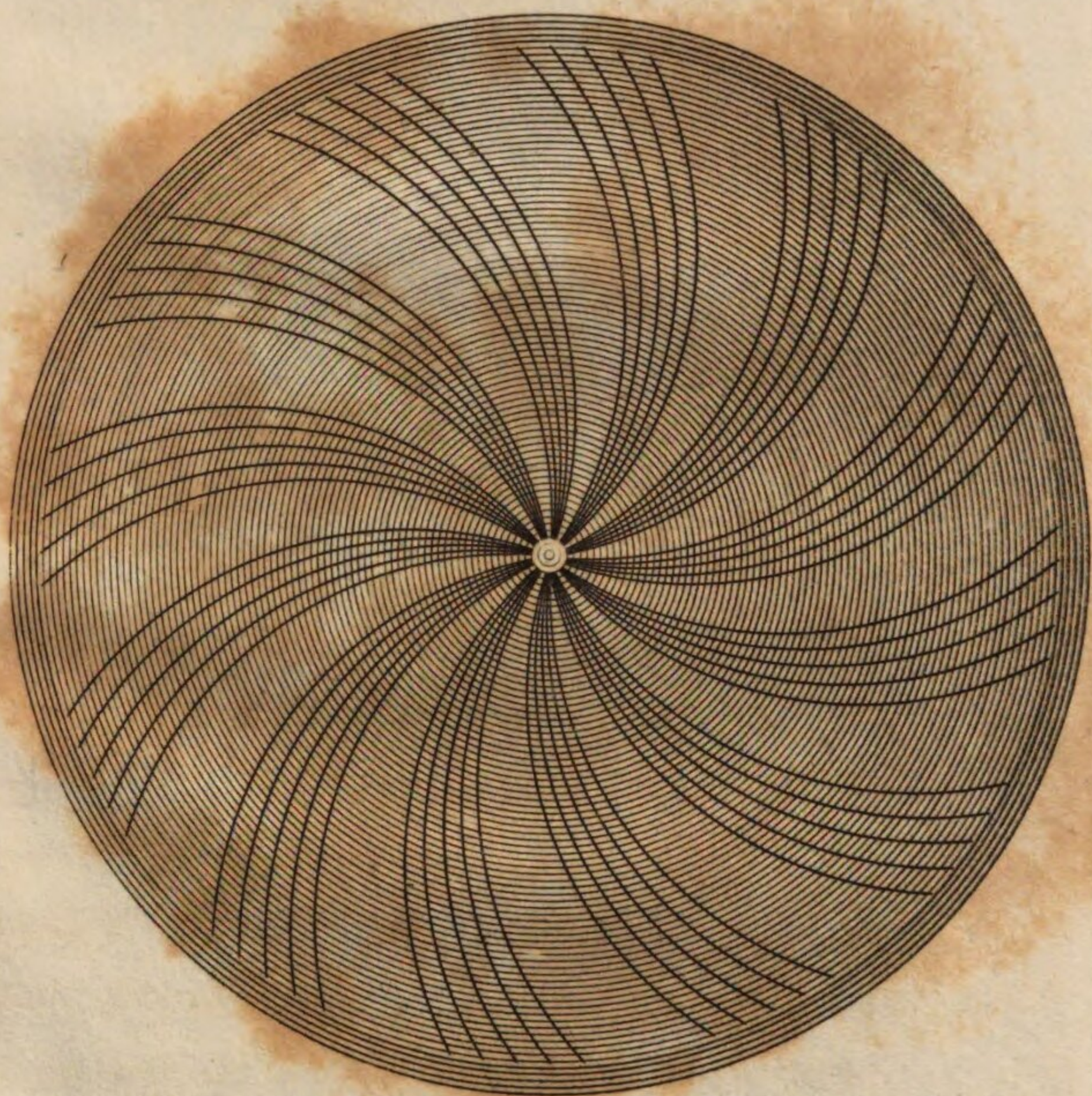


PLATE V.



brought to a plane and polished surface. Then place an angular tool, No. 28, in the slide rest, adjust its point, the slide rest, and the eccentric chuck, to the common centre, and proceed to execute the concentric circles.

THE CONCENTRIC CIRCLES.



Radius of the first circle equal to 1.

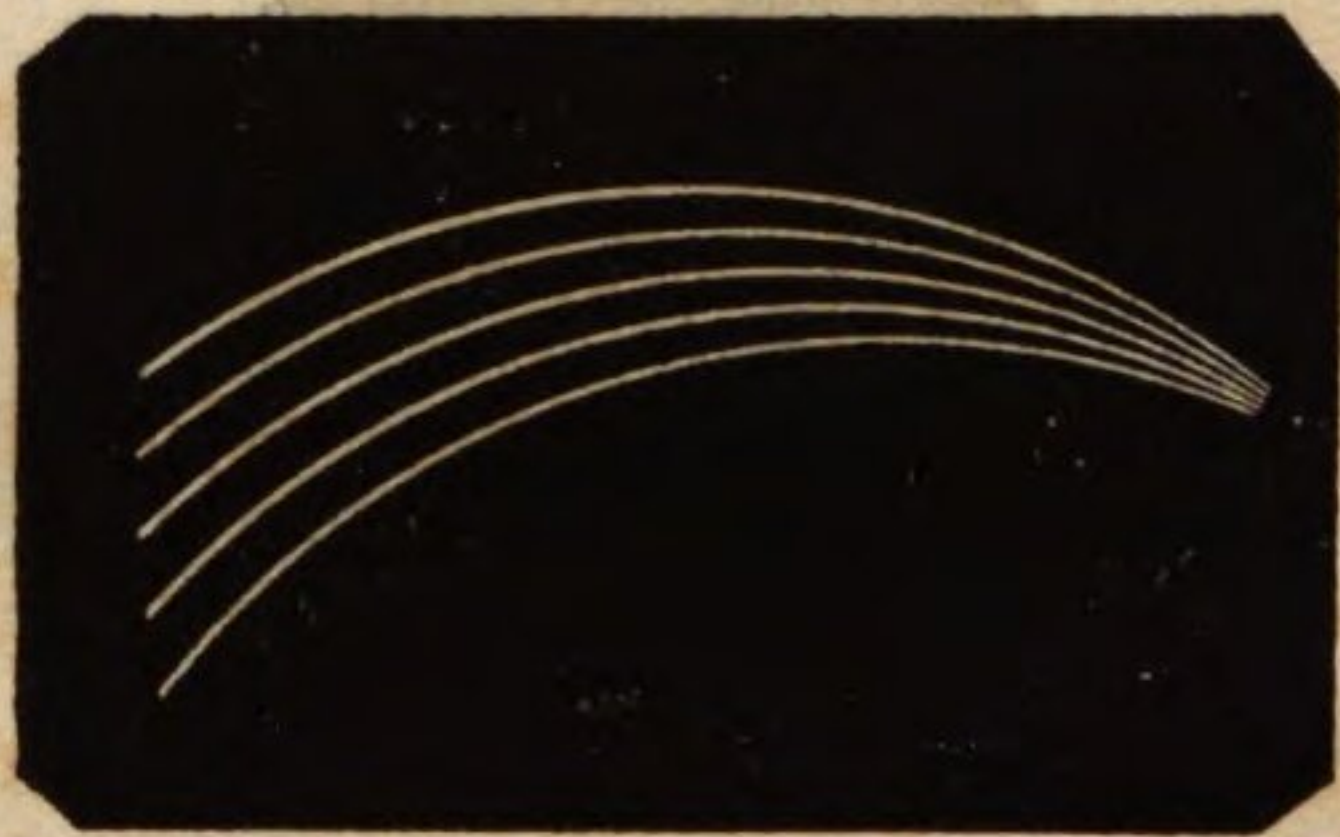
Radius of the second circle equal to $1\frac{1}{2}$.

Radius of the third circle equal to 2, &c.

To produce the radius for the first, or internal circle, turn the slide rest screw backwards one turn. Describe one circle. To produce the radius for the second circle, encrease the radius of the former

by turning the slide rest screw backwards half a turn. Describe another circle; and so on, encreasing the radius of each succeeding circle, by turning the slide rest screw backwards half a turn, until eighty circles are produced.

THE ARCS OF CIRCLES, OR CURVED LINES.



Eccentricity equal to 30.

Radius equal to 30.

Measure of the arcs equal to $\frac{10}{48}$.*

These arcs of circles, or curved lines, are to be cut with a similar angular tool,

* The method of producing and measuring the arcs, already described for Specimen IV, must be attended to in this Specimen. Vide p. 50.

No. 28, and to the same depth as the concentric circles. Supposing the radius of the exterior of the concentric circles to have been equal to $40\frac{1}{2}$, produce the radius for the arcs, or curved lines, and make it equal to 30, by turning the slide rest screw forwards ten turns and a half. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards thirty turns. Turn the mandril pulley wheel, until the centre of the interior concentric circle coincides with the point of the tool. Move the pulley wheel forward, without letting the tool touch the work, equal to an arc of $\frac{23}{48}$, and put on a stop to prevent its moving beyond that point. Move the pulley wheel back again equal to an arc of $\frac{20}{48}$, and put on a stop to prevent its moving any further that way.

The tool being now applied to the surface of the work, and the mandril pulley wheel moved through the space thus limited by the stops, an arc will be described

equal to $\frac{2}{4} \frac{0}{8}$; viz. an arc, which will begin at a distance from the common centre equal to $\frac{3}{4} \frac{8}{8}$, and end at a distance from the common centre equal to $\frac{2}{4} \frac{3}{8}$.

There are twelve sets of these arcs to be produced and arranged in the following manner; each set to consist of five arcs.

Set the circle of the eccentric chuck (supposing it to be divided into 96,) at division 96, and describe one arc at that and at the four succeeding divisions: miss three divisions, set the circle of the eccentric chuck at division 8, and describe five other circles; and so on for the rest. The divisions of the circle of the eccentric chuck, at which the arcs in each set are to be described, are as under.

- 1st set of arcs, at Nos. 96, 1, 2, 3, 4.
- 2nd do. 8, 9, 10, 11, 12.
- 3rd do. 16, 17, 18, 19, 20.
- 4th do. 24, 25, 26, 27, 28.
- 5th do. 32, 33, 34, 35, 36.
- 6th do. 40, 41, 42, 43, 44.

7th set of arcs, at	48, 49, 50, 51, 52.
8th do.	56, 57, 58, 59, 60.
9th do.	64, 65, 66, 67, 68.
10th do.	72, 73, 74, 75, 76.
11th do.	80, 81, 82, 83, 84.
12th do.	88, 89, 90, 91, 92.

SPECIMEN VI.

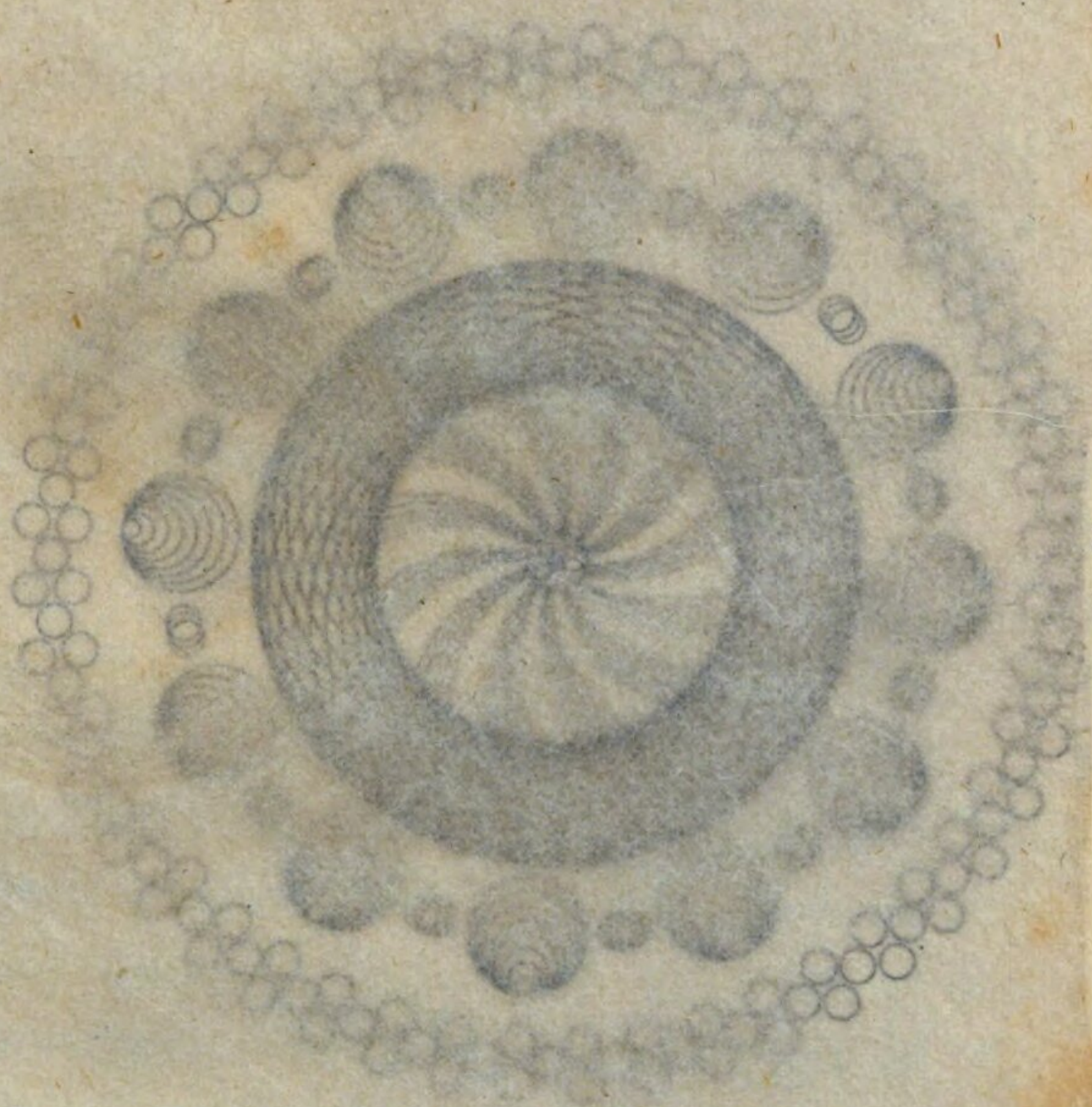


THE accompanying Plate (VI) represents the manner in which the sets of eccentric circles, and the sets of arcs, or curved lines, are to be arranged in this Specimen. The sets of circles are of different eccentricities and radii; and the arcs, or curved lines, are all of the same measure, and are produced from points without, and equidistant from, the common centre.

To form a piece of Eccentric Circular Turning, corresponding with this Specimen, use a double angular tool, No. 28, and set the slide rest at right angles with the mandril of the lathe.

The work to be turned is to be first properly fixed in the eccentric chuck, and brought to a plane and polished surface.

PLATE VI.



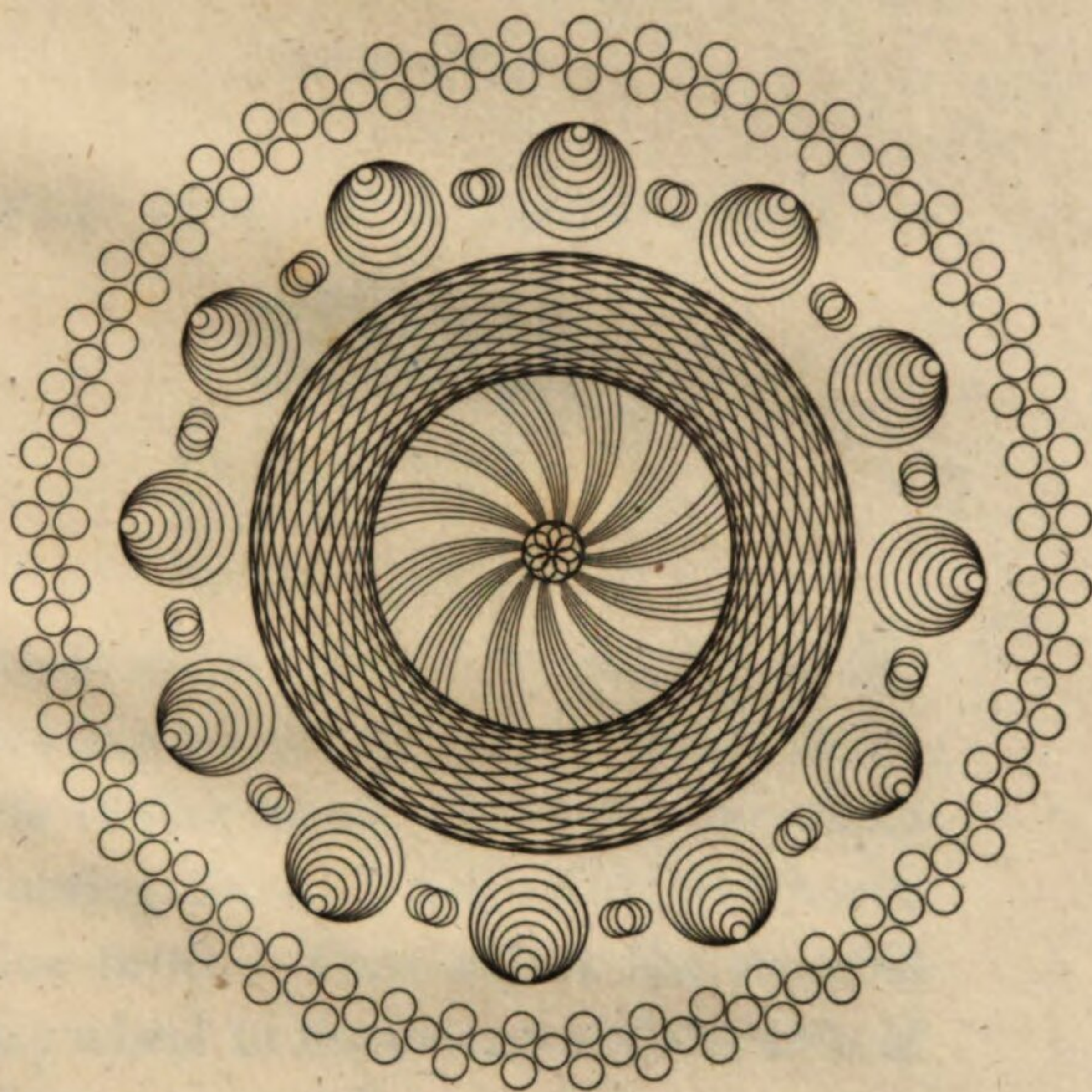
SPECIMEN VI

The accompanying Plate VI, represents the manner in which the sets of concentric circles, and the sets of arcs, or concentric lines, are to be arranged in this Specimen. The sets of circles are of different eccentricities and radii; and the arcs, or concentric lines, are all of the same eccentricity, and are produced from points distant, and equidistant from, the common centre.

To form a piece of Eccentric Circular Turning corresponding with this Specimen, use a double angular tool. No. 10, and set the slide rest at right angles with the axis of the lathe.

The work to be turned is to be first mounted in the eccentric chuck, and brought to a true and polished surface.

PLATE VI.



Then place the angular tool, No. 28, in the slide rest ; adjust its point, the slide rest, and the eccentric chuck, to the common centre ; and proceed to execute the arcs of circles, or curved lines.

THE ARCS, OR CURVED LINES.



Eccentricity equal to 12.

Radius equal to 12.

Measure of the arcs $\frac{7}{48}$.

Produce the eccentricity by turning the slide screw of the eccentric chuck backwards twelve turns. Produce the radius by turning the slide rest screw backwards twelve turns. Then adjust the mandril pulley wheel to the measure of the arcs of circles, or curved lines, in the same manner as directed for those in Specimen V.

These arcs of circles are, in all respects, similar to those referred to, except in their

dimensions, and are to be described exactly in the same manner, at the same divisions of the circle of the eccentric chuck, at the same distance from the common centre, and should be cut sufficiently deep to bring the surface left between them to an angle at top.

*CENTRE FIGURE, OR FIRST SET
OF CIRCLES.*



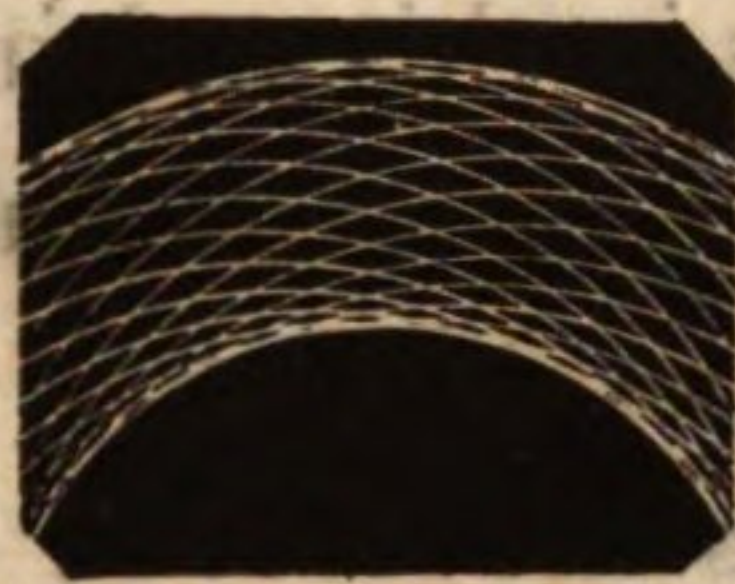
Eccentricity equal to $1\frac{1}{4}$.

Radius equal to 1.

Remove the stops from the mandril pulley wheel, and continue with the angular tool, No. 28. Produce the eccentricity by turning the slide screw of the eccentric chuck forwards ten turns and three-quarters of a turn. Produce the

radius by turning the slide rest screw forwards eleven turns. Describe eight equidistant circles, of the same depth as the curved lines.

SECOND SET OF CIRCLES.



Eccentricity equal to $4\frac{3}{8}$.

Radius equal to 17.

The same angular tool, No. 28, as before, and the circles are to be cut to a sufficient depth to make the spaces, which their intersection leaves, sharp at top. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards three turns and one-eighth of a turn. Produce the radius by turning the slide rest screw backwards sixteen turns. Describe twenty-four equidistant circles.

THIRD SET OF CIRCLES.

Eccentricity equal to 30.

Radius equal to $\frac{1}{2}$.

The circles in this and in the following seven sets, are to be produced by the angular tool, No. 28, and all cut to the same depth as the second set. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards twenty-five turns and five-eighths of a turn. Produce the radius by turning the slide rest screw forwards sixteen turns and a half. Describe twelve equidistant circles.

FOURTH SET OF CIRCLES.



Eccentricity equal to $29\frac{1}{2}$.

Radius equal to 1.

The eccentricity is to be obtained by turning the slide screw of the eccentric chuck forwards half a turn. Obtain the radius by turning the slide rest screw backwards half a turn. Then describe twelve equidistant circles, which are to circumscribe those of the third set.

FIFTH SET OF CIRCLES.

Eccentricity equal to 29.

Radius equal to $1\frac{1}{2}$.

Produce the eccentricity by turning the slide screw of the eccentric chuck forwards half a turn. Produce the radius by turning the slide rest screw backwards half a turn. Describe twelve equidistant circles, which are to circumscribe those of the fourth set.

SIXTH SET OF CIRCLES.

Eccentricity equal to $28\frac{1}{2}$.

Radius equal to 2.

The eccentricity is to be produced by turning the slide screw of the eccentric chuck forwards half a turn. Produce the radius by turning the slide rest screw backwards half a turn. Describe twelve equidistant circles, which are to circumscribe those of the fifth set.

SEVENTH SET OF CIRCLES.

Eccentricity equal to 28.

Radius equal to $2\frac{1}{2}$.

Produce the eccentricity by turning the slide screw of the eccentric chuck forwards half a turn. Produce the radius by turning the slide rest screw backwards half a turn. Describe twelve equidistant circles, which are to circumscribe those of the sixth set.

EIGHTH SET OF CIRCLES.

Eccentricity equal to $27\frac{1}{2}$.

Radius equal to 3.

Produce the eccentricity by turning the slide screw of the eccentric chuck forwards half a turn. Produce the radius by turning the slide rest screw backwards half a turn. Describe twelve equidistant circles, which are to circumscribe those of the seventh set.

NINTH SET OF CIRCLES.

Eccentricity equal to 27.

Radius equal to $3\frac{1}{2}$.

Produce the eccentricity by turning the slide screw of the eccentric chuck forwards half a turn. The radius is to be produced by turning the slide rest screw backwards half a turn. Describe twelve equidistant circles, which are to circumscribe those of the eighth set.

TENTH SET OF CIRCLES.

Eccentricity equal to $26\frac{1}{2}$.

Radius equal to 4.

To obtain the eccentricity turn the slide screw of the eccentric chuck backwards half a turn: and produce the radius by turning the slide rest screw forwards half a turn. Then describe twelve equidistant circles, which are to circumscribe those of the ninth set, and complete this figure.

ELEVENTH SET OF CIRCLES.

Eccentricity equal to $23\frac{1}{2}$.

Radius equal to 1.

Proceed with the same angular tool, No. 28: and cut the circles sufficiently deep to make the spaces left between, or within the circles, sharp at top: this set of circles, as represented in the Plate (VI), is produced by a division of the circle of the eccentric chuck of 288.

Produce the eccentricity by turning the slide screw of the eccentric chuck forwards three turns. Produce the radius by turning the slide rest screw forwards three turns. Then set the circle of the eccentric chuck (supposing it to be divided into 288) at division 288: miss ten divisions, set the circle of the eccentric chuck at division 11, and describe one

circle at that and at each of the two succeeding divisions, *viz.* at division 12 and 13: miss ten divisions, set the circle of the eccentric chuck at division 24, and describe one circle at that and at the two succeeding divisions, *viz.* at divisions 25 and 26; and so on, missing ten divisions, and describing three circles, until the figure represented in the Plate (VI) be completed.

The following may be substituted where the circle of the eccentric chuck is divided into only ninety-six.

ELEVENTH SET OF CIRCLES.

ADAPTED TO A DIVISION OF NINETY-SIX.



Eccentricity of the uppermost circle equal to 25.

Eccentricity of the centre circle equal to $23\frac{1}{2}$.

Eccentricity of the lowermost circle equal to 22.

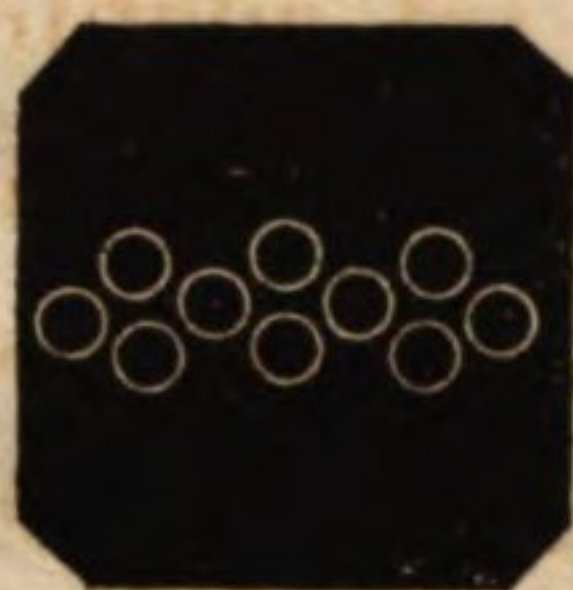
Radius equal to 1.

Produce the eccentricity and radius, for the centre circle, in the manner directed for the set adapted to a division of 288, and describe one circle at each of the following divisions of the circle of the eccentric chuck, *viz.* at 4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92.

Obtain the eccentricity for the uppermost circle by turning the slide screw of the eccentric chuck backwards one turn and half a turn; and, with the same radius, describe one circle at each of the divisions of the circle of the eccentric chuck, as before. Obtain the eccentricity

city for the lowermost circle, by turning the slide screw of the eccentric chuck forwards three turns; and, with the same radius as before, describe one circle at each of the divisions of the circle of the eccentric chuck before specified for the centre circle.

TWELFTH SET OF CIRCLES.



Eccentricity equal to 34.

Radius equal to 1.

Proceed with the same angular tool, No. 28, and cut the circles sufficiently deep to make their centres sharp at top: the lowermost of the three circles are those which are to be produced. Produce the eccentricity by turning the slide screw

of the eccentric chuck backwards twelve turns. The radius remains as before. Describe forty-eight equidistant circles; one circle (supposing the circle of the eccentric chuck to be divided into 96) at each of the following divisions, *viz.* 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96.

THIRTEENTH SET OF CIRCLES.



Eccentricity equal to 37.

Radius equal to 1.

The circles now to be described are the uppermost of the three circles, repre-

sented in this illustration. Produce the eccentricity by turning the slide screw of the eccentric chuck backwards three turns; and, with the same radius as before, describe one circle at each of the divisions of the eccentric chuck named for the twelfth set.

FOURTEENTH SET OF CIRCLES.

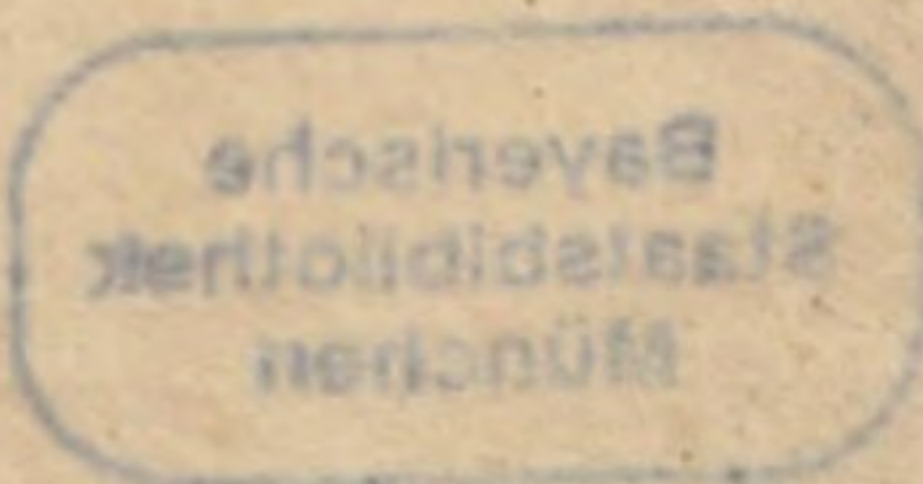


Eccentricity equal to $35\frac{1}{2}$.

Radius equal to 1.

The circles now to be produced are the centre of the three circles, represented in this illustration.

Produce the eccentricity by turning the slide screw of the eccentric chuck forwards one turn and a half; and, with the



same radius as before, describe one circle (supposing the circle of the eccentric chuck to be divided into ninety-six) at each of the following divisions, *viz.* 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95.

THE END.

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